Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

JULY, 1960

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A.E.S. Annual Convention
47th in Los Angeles

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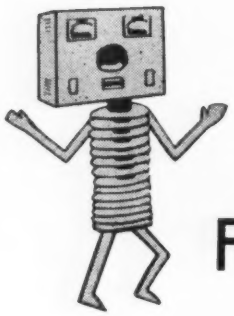
Read and pass on—



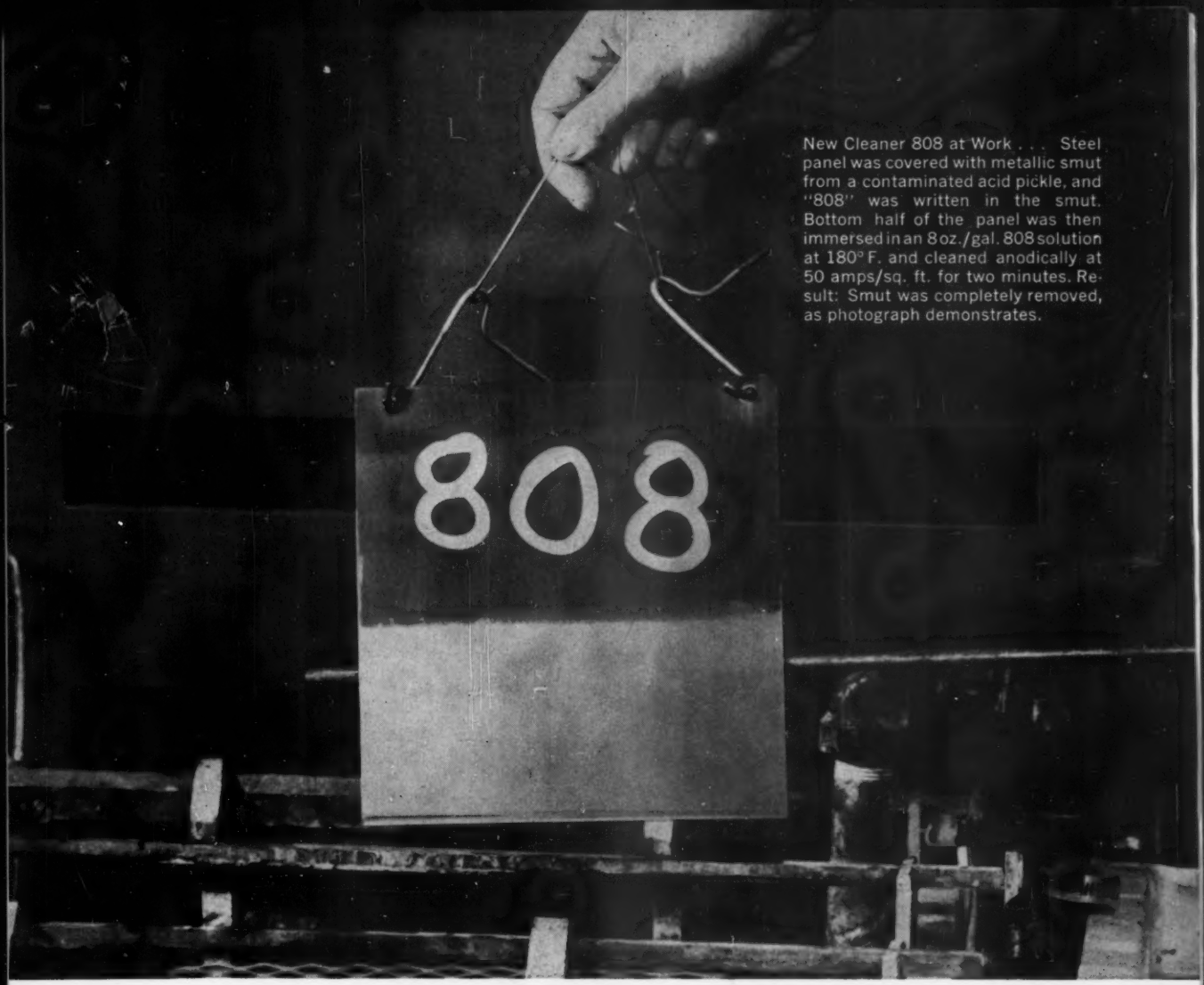
RAPID ELECTRIC COMPANY, Inc.

Cordially extends an **OPEN HOUSE**
invitation the week of

July 24th - 28th

during the A. E. S. Convention
HOTEL STATLER-HILTON
Los Angeles, California

COCKTAILS AT 7 P. M.



New Cleaner 808 at Work . . . Steel panel was covered with metallic smut from a contaminated acid pickle, and "808" was written in the smut. Bottom half of the panel was then immersed in an 8 oz./gal. 808 solution at 180° F. and cleaned anodically at 50 amps/sq. ft. for two minutes. Result: Smut was completely removed, as photograph demonstrates.

For Steel . . . **NEW CHELATING ELECTRO-CLEANER**
Removes Light Rust, Scale, Smut, Oxides

Cleaner 808, a new development of Enthonics research, is an alkaline electro-cleaner with chelating action. Its selective chelating agents chemically encircle and remove smut, oxides, light scale and rust. Its high-detergency, high-conductivity ingredients complete the cleaning job. Result: Bright surfaces completely free of contamination.

Cleaner 808 is excellent for anodic cleaning of steel which has just enough rust or scale to defy conventional electro-cleaners. In most applications, by using the work as an anode at current densities of 50-75 amps/sq. ft., cleaning time is 1 to 5 minutes. Cleaner 808 also is being used cathodically. One such application: Cleaning used automobile bumpers for replating.

Cleaner 808 is a dustless, free-flowing alkaline powder with superior wetting, penetrating and dispersing characteristics, and water softening action. A low foam blanket minimizes spray and hydrogen gas explosion. Because oils are displaced and float to the surface, the cleaning solution is free of contamination, has long life.

For complete information about Cleaner 808 with chelating action, write to Enthone, Inc., 442 Elm Street, New Haven 8, Conn.

ASARCO

ANOTHER PRODUCT OF *Enthonics* RESEARCH

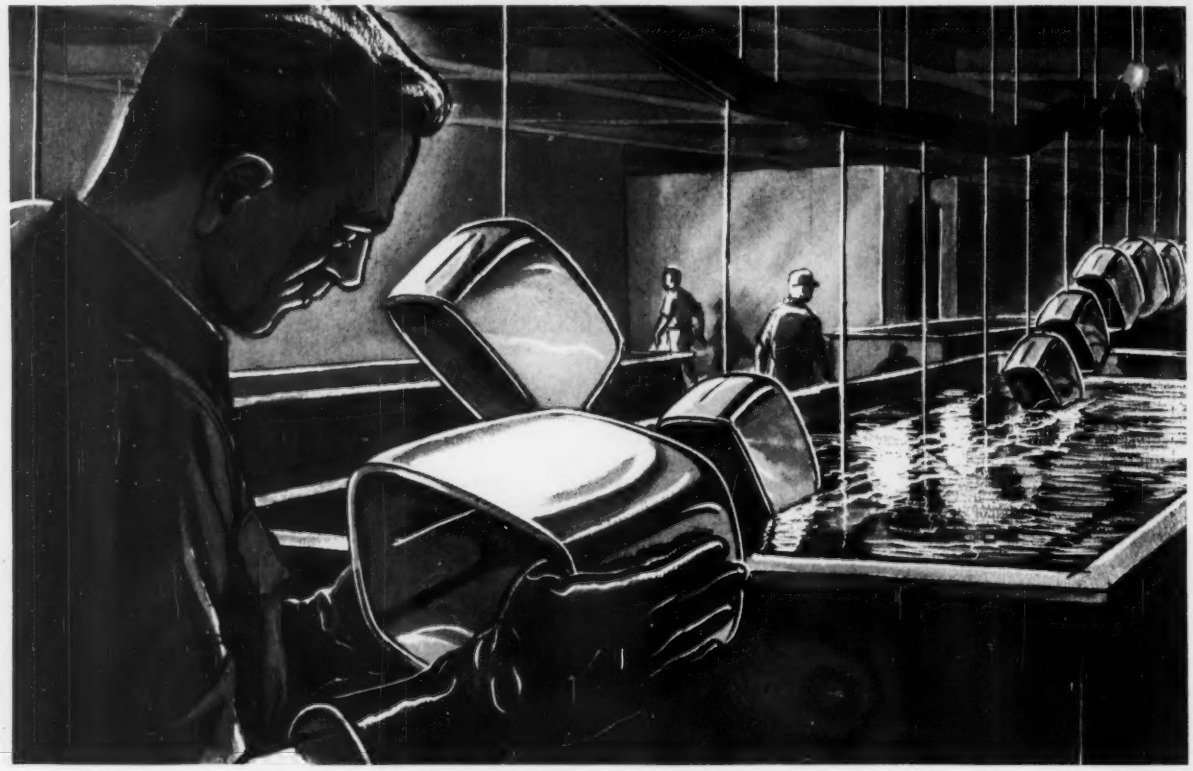
ENTHONE

A Subsidiary of American Smelting and Refining Company

For extra aids in cutting plating rejects...

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS



Stop spots, add sparkle to plated parts with Oakite RINSITE® in final rinse

Just a little Oakite Rinsite in the final rinse after plating cuts rejects due to water spotting and staining. How? Rinsite "thins out" the rinse water, makes it drain more quickly, more completely.

While it leaves no drops to cause stains or tarnish... it *does* leave a thin, non-oily, invisible film that not only gives plated parts extra sparkle, but also protects against indoor rust.

Rinsite does a remarkable job in cold, hard rinse water. If you do tumbling operations, add Rinsite to the rinse and see how metal parts retain their newly-achieved gleam.

This liquid rinsing aid is just one of a line of Oakite materials to help avoid plating rejects. There are hard-working pre-cleaners... precision electro-cleaners for various metals. If you're interested in *results*, ask Oakite. Send today for Bulletin F-9822. Oakite Products, Inc., 40 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 Est. 1909 SCIENCE

years' leadership in industrial cleaning

METAL FINISHING is published monthly by Metals and Plastics Publications, Inc., 381 Broadway, Westwood, N. J., U.S.A.
SECOND CLASS POSTAGE PAID at the Post Office in Westwood, N. J. and New York, N. Y. Volume 58, No. 7, July, 1960. Five dollars per year.

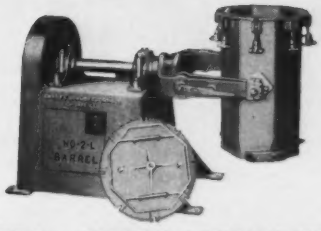
62 . . . . for 62 years!

Manufacturing Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing

Chas. F. L'Hommedieu & Sons Co.

No. 18 — VARIABLE SPEED POLISHING LATHE

Independent spindles—each with separate patented Variable Speed Drive and controls — ball-bearing throughout. Powered by two up to 25 H.P. motors. Adopted by leading manufacturers as standard equipment.

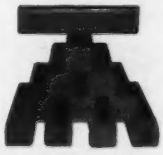


TYPE L — DOUBLE ACTION BARREL
For ABRASIVE TUMBLING or BALL BURNISHING

The cylinder can be operated at an angle for producing a double tumbling action—thus producing a better and more uniform finish in a much shorter time.

Longer pieces finished more uniformly and without bending.

RELIANCE KUL-KUT BUFFS
FOR FAST CUTTING



RELIANCE EXTRUDED COMPOSITIONS
STANDARD SIZE
2 x 2 x 10"

THEY CUT • THEY CLEAN • THEY COLOR

- **DURABILITY**
- **PRODUCTION**
- **ECONOMY**
- **EFFICIENCY**

THE ANSWER TO INCREASED PRODUCTION AT LOWER COST!

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The Davies man who calls on you is a technically qualified engineer, backed up by a staff armed with education at 13 universities, and 135 years of plating experience.
When you have a plating or coating problem, you want engineering help, not sales talk. That's the best reason for you to depend on Davies.

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CUSTOM DESIGNERS of PLATING and ANODIZING RACKS • *Biggest Coating Plant West of Chicago*

AT HILFINGER CORPORATION

"Bagging" Eliminated by Using OFHC® Anodes for Plating Zinc Die Castings

The even dissolution of *impurity-free* OFHC Brand Anodes eliminated the need for costly anode bags at Hilfinger Corporation of Toledo, Ohio. With anode bags discarded, *all* plating copper is utilized–none is wasted in bags that gum-up and require frequent down-time for cleaning or replacement. Now Hilfinger gets consistently smoother plating on automotive and appliance zinc die castings in copper cyanide baths. And by eliminating "bagging," OFHC Brand Anodes permit higher current density operation . . . faster, more economical production.

Smoother Plating, Less Scrap with OFHC Anodes

Hilfinger saves on scrap too! The resultant "fish" from OFHC Anodes are stripped to the bone–less than 8% of the original weight. OFHC Anodes keep producing and dissolving uniformly from top to bottom. They are the purest anodes produced, 99.99+% copper, completely free of oxides and residual deoxidants. Purity and high density result in smoother plating with less scrap loss. . . . *more usable copper per pound of anode.*

Free technical publications to help you obtain better plating are available from OFHC Anode Distributors, or directly from AMCO Technical Service Section. Ask for them today.

Three small drums of "fish" . . . all that remains of 10,000 lbs. of OFHC Anodes!

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a division of
American Metal Climax, Inc.
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SUPERLUME

THE PREMIUM BRIGHT NICKEL BATH

H-VW-M

Progress in metal finishing through advanced processes • equipment

we admit it

There may be other baths as bright as H-VW-M Superlume

But

SUPERLUME

IS THE MOST DUCTILE AT HIGHEST LEVELLING

SUPERLUME

LEVELS BEST

Sure, it costs a little more than conventional bright baths—but no more than other baths that are almost as good as fast plating Superlume. Why not get the best! Write or call for full details.

Hanson-Van Winkle-Munning Company, Marawan, New Jersey • Offices in Principal Cities
Alert Supply Company is H-VW-M in the West • Los Angeles • San Francisco

HARSHAW

CYNOREX

BRIGHT COPPER PLATING PROCESS

The only copper bath with these 3 features

1

SIMPLE* OPERATION

Cynorex is the only copper bath with just one non-metallic addition agent. You'll have no juggling of two or three brighteners.

*See Webster's Definition

2

NO CHROME CONTAMINATION PROBLEM

Cynorex is self-purifying.

3

CARBON FILTRATION WITHOUT ADDITION AGENT LOSS

Cynorex can be continuously circulated thru carbon.

HARSHAW

There are more features we'd like to explain to you...

contact us at any of the offices listed below.

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CHICAGO 32, ILLINOIS • CINCINNATI 13, OHIO • CLEVELAND 6, OHIO • DETROIT 28, MICHIGAN • HASTINGS-ON-HUDSON 6, N.Y. • HOUSTON 11, TEXAS • LOS ANGELES 22, CALIF. • PHILADELPHIA 43, PA. • PITTSBURGH 22, PA.

Plating Processes also available through the following Foreign Distributors or Manufacturers:

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ARMALITE CO. LTD., TORONTO, CANADA
L. VAN DER HOORN, UTRECHT, HOLLAND
ROBERT BRYCE & CO. LTD., MELBOURNE, AUSTRALIA

And many Agents throughout the world

HARSHAW

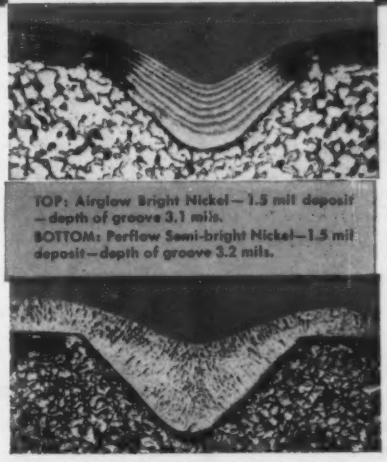
HARSHAW Airglow

AIR-AGITATED BRIGHT NICKEL PROCESS

Gives you insurance against air supply failure because it operates efficiently with any agitation system.

Airglow allows the use of current densities much higher than attainable from mechanically agitated systems.

Levelling effects of Harshaw Airglow Bright Nickel deposit compared to that of Harshaw Perflow leveling semi-bright nickel.



TOP: Airglow Bright Nickel—1.5 mil deposit —depth of groove 3.1 mils.
BOTTOM: Perflow Semi-bright Nickel—1.5 mil deposit—depth of groove 3.2 mils.

- Airglow depth of color and brightness unequalled.
- Airglow corrosion resistance—the best of any bright nickel.
- Airglow gives levelling comparable to Perflow levelling!
- Airglow gives economies unusual for bright nickel.

Let us show you!

Allow us to give you the complete story on this outstanding process by contacting the nearest Harshaw office.

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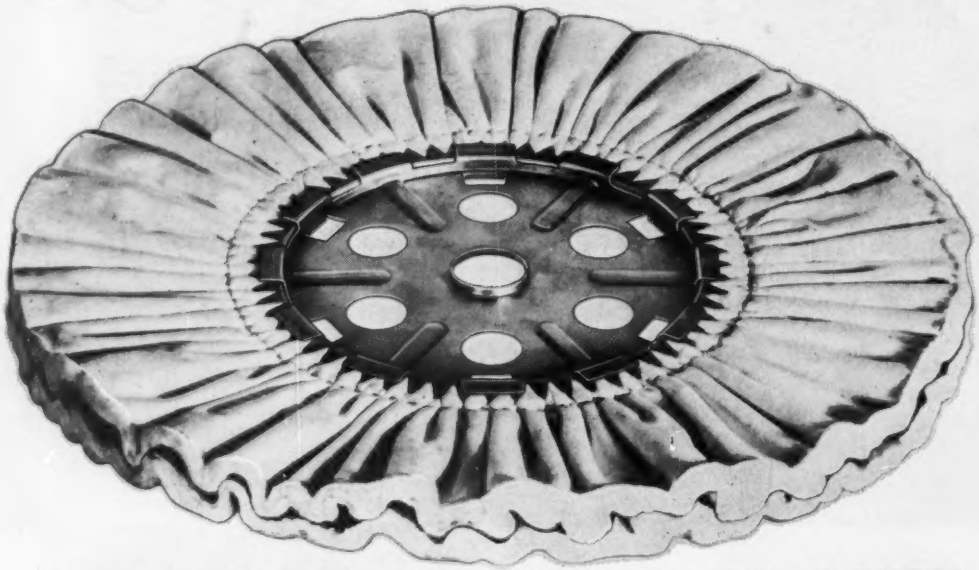
And many Agents throughout the world

GARFIELD *assurances of constant quality*

with GARFIELD "Custom-Tailored" Buffs, you're always ready to do the hard job, the special job, the QUALITY job — better, faster and more economically.



FOR **SUPER-HEAVY** CUT ALL METALS **AIRFLEX BUFFS**

The "Garfield" Ventilated Bias Type Buffs are Stronger — Bias Cut Cloth Construction — Does not Fray or Ravel — Perfectly Balanced — Made of High Count Long-Fibre Heavy Weight Cotton — Last Longer — Assembled on Ventilated Steel Centers for Cooler Running — Allows Lower Compound Consumption and Retains Better Compound Head — Leaves No Streaks on Buffed Surfaces — Twice as Wide as Ordinary Buffs — Faster Set-Up Time — Less Machine Wear — CONSISTENT QUALITY.

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Ekco Products Company knows that quality chrome plating gives products permanent brilliance. That's why Ekco uses Mutual® Chromic Acid to plate their Autoyre line of bath, kitchen and closet accessories. Careful control, plating skill plus Mutual Chromic Acid help achieve Ekco's patented Armorized* Chrome-12*, a top quality chrome finish which sells merchandise.

Mutual Chromic Acid is always 99.75% pure—or better. Its low sulfate content (less than 0.1%) makes it easier for you to control the acid-sulfate ratio of your plating bath. This safeguards against plating difficulties—and expensive rejects!

To learn more about these and other advantages of Mutual Chromic Acid, send coupon for our free booklet, "Chromium Chemicals." Our Technical Service Staff will also be happy to answer your questions.

*Trade Marks owned by Ekco Products Company

OTHER PRODUCTS FOR PLATERS

SOLVAY® Ammonium Bicarbonate ■ SOLVAY Caustic Soda
SOLVAY Hydrogen Peroxide ■ SOLVAY Methylene Chloride

Allied Chemical

SOLVAY PROCESS DIVISION
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DOW
SOLVENTS

ANNOUNCING...

Chlorothene NU

New stabilizer system solves corrosion problems—makes recovery easy!

Newly developed Chlorothene® NU combines high solvency and safety with an advanced stabilizer system that makes possible an extraordinary range of cold-cleaning applications—makes recovery easy, too!

The exceptional stability of Chlorothene NU (specially inhibited 1,1,1-trichloroethane) practically eliminates corrosion of sensitive metals. You can use it for cleaning aluminum, zinc, and white-metal alloys—as well as other metals, many plastics, rubber products and other materials.

Because increased stability makes recovery easy and practical, you can enjoy the economy of using Chlorothene NU over and over again. In most cases, existing equipment, such as a trichloroethylene still, does an excellent job.

Safe two ways! Low in toxicity, Chlorothene NU has a maximum allowable vapor concentration of 500 parts per million. That's closely comparable to many flammable solvents and is substantially more favorable than most chlorinated solvents. In addition, Chlorothene NU has no fire or flash point, as measured by standard methods. These features not only make Chlorothene NU safer to use—they simplify new cleaning systems and waste disposal.

COLOR CODED—For easy identification, even from 100 feet away, drums of Chlorothene NU are distinctively color-coded in green and white. For more information about Chlorothene NU, call your distributor of Dow solvents. He knows all about its use, recovery and comparative cost. Or contact your nearest Dow sales office.

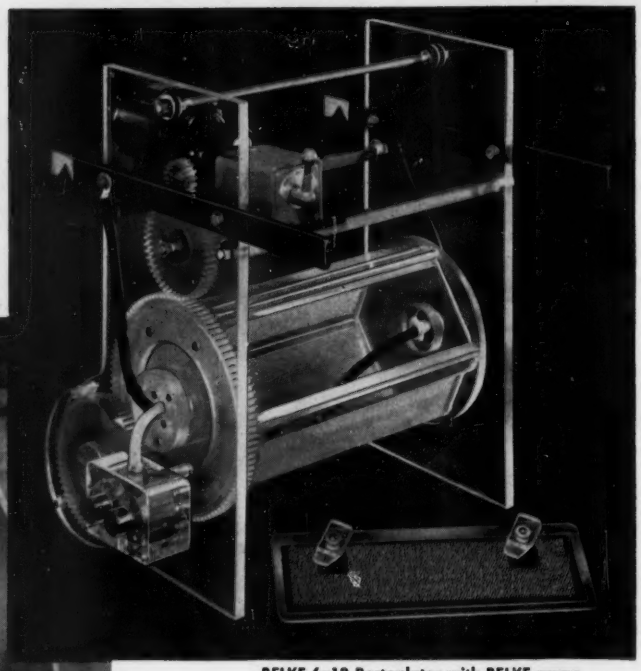
THE RIGHT SOLVENT FOR THOUSANDS OF INDUSTRIAL USES. Not only is Chlorothene NU recommended for cold-cleaning dip operations on the production line—it also cleans by spray, bucket or wipe methods. It's an all-purpose solvent for many applications, both on the production line and for maintenance use.

SEE YOUR DISTRIBUTOR OF DOW SOLVENTS FIRST!

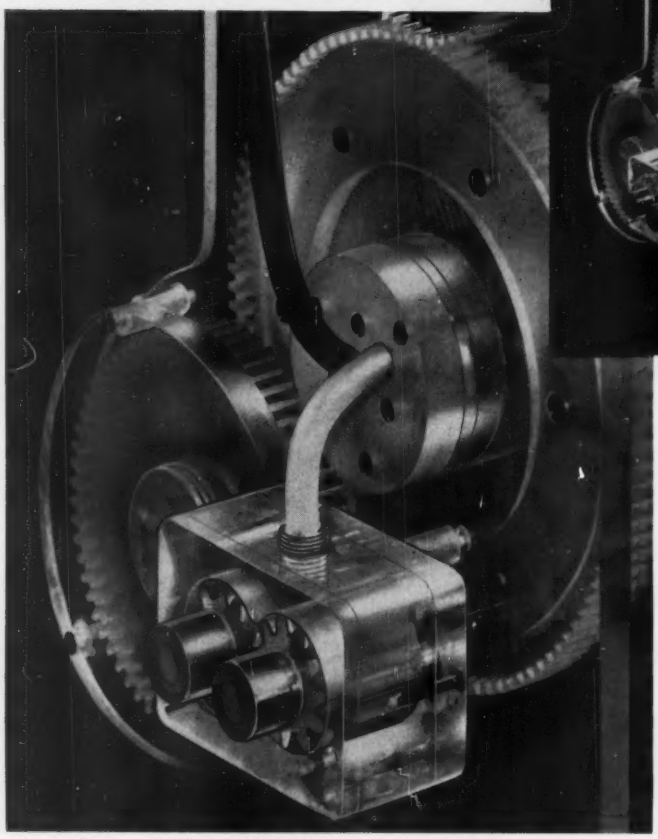
The widest line of industrial solvents: Trichloroethylene, Perchloroethylene, Methylene Chloride, Chlorothene NU.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN DOW

Pumps solution into cylinders with small openings



BELKE 6x12 Portoplater with BELKE pump



Lucite Plating Barrel Pump made by BELKE

Cracks the barrier to a big new field of plating opportunity

Most platers know the problems presented in plating small, slender pieces such as needles. Such work requires cylinders with very small perforations. The small holes slow down movement of solution through the cylinder.

In addition, the small pieces make a dense load that takes plating metal from the solution very fast; with a normal load the solution does not bring enough metal into the cylinder and slow plating and poor plating results.

The new BELKE pump-equipped portoplater solves this problem. The cylinder-driven pump forces solution into the cylinder; brings in new solution with the needed metal regardless of perforation size.

The result is improved plating and increased output with all small, compact plating loads plus the ability to plate efficiently work heretofore not practical for barrel plating.

Whatever your requirements for plating room equipment, send specifications or write.

BELKE
Pump-Equipped Portoplater

FEATURES

1. Cylinder driven pump forces solution into cylinder providing positive solution change regardless of size of perforations.
2. Pumping rate—60 gallons per hour.
3. Suitable for most solutions.
4. Plating capacity—two quarts.
5. Cylinder—O.D. 9x15; I.D. 6x12.
6. Motor—115 V, 60 cycles.
7. Perforations—Specify.

Belke MANUFACTURING COMPANY
947 N. Cicero, Chicago 51, Ill.
TRADE MARK
EVERYTHING FOR PLATING PLANTS

finishing...with a profit

• ELECTROPOLISHING • ELECTRODEBURRING

improved finish and corrosion protection through maximum leveling action

THE BATTELLE PROCESS WILL ELECTROPOLISH OR DEBURR THESE METALS: stainless steel, 300 and 400 series; carbon steel, aluminum, brass, copper, berylium, nickel, and nickel silver.

ELECTROPOLISHING

Here, in an unretouched photomicrograph, you see a steel surface cut up by abrasive polishing; slightly improved by burnishing; transformed into a smooth surface of lasting beauty when electropolished instead of burnished.

The absence of damaged metal caused by abrasive polishing makes the electropolished surface the best possible base for high quality electroplating. We can electropolish aluminum, brass, copper, nickel, nickel silver, carbon steel, stainless steel.

a metal surface magnified 10,000 times

from this (Abrasive Polished)

you get this (Burnished)

or this (Electropolished by Battelle developed process)

ELECTROPOLISHING

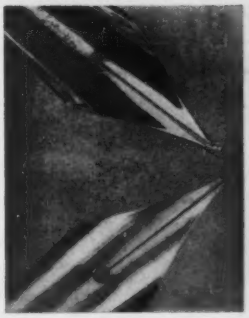
A FEW EXAMPLES

ELECTRODEBURRING

Safe handling and smooth action of formed metal parts require the removal of burrs.

Electrodeburring is the ideal process for smoothing sharp, burred metal.

The pen point, "before" (bottom) and "after" (top), illustrates how small products may be profitably deburred.



Parts for engines, pumps, precision machinery, cars, planes, appliances and for many other uses can be electrodeburred.

Maximum luster is obtained in five to ten minutes. For some items electrodeburring followed by electroplating produces the ideal finish. Being a form of electropolishing, electrodeburring makes use of similar basic equipment, solutions, and procedures.

DATA, EQUIPMENT AND SOLUTIONS SUPPLIED BY:

THE ENEQUIST CHEMICAL CO., INC.

100 VARICK AVENUE BROOKLYN 37, N. Y.

ENEQUIST CHEMICALS QUALITY

whatever your finishing problem

ACME has—or will design—a machine to solve it

Buffing door knobs with a unique and compact Acme machine arrangement produces high volume output. Reducing space in a production line can save important "hidden costs" which cut into profits. Acme utilizes its versatile, floating triple-head buffing lathe to accomplish more buffing in less space. This is one of the operations performed on a high production machine unit which removes "orange peel" and surface defects from all the curved surfaces of the part—gives the knobs an extra smooth, flawless, high color finish, ready for plating.

■ Here is the kind of efficiency that cost-conscious manufacturers expect—*and get*—from Acme. This reputation for excellence has been earned during 50 years of leadership in solving deburring, polishing, and buffing problems for a wide variety of manufacturers. Building hardware, automotive trim, electrical and plumbing fixtures, household appliances and kitchenware, primary metal sheets and coils—these are some of the many mass-produced parts now served efficiently by Acme machines. Call or write for comprehensive catalog today.

ACME MANUFACTURING COMPANY

1400 E. 9 MILE ROAD, DETROIT 20 (FERNDALE), MICHIGAN
LEADING PRODUCERS OF AUTOMATIC POLISHING & BUFFING MACHINES SINCE 1910

A new idea in plating

ANACONDA

announces

"PLUS-4"

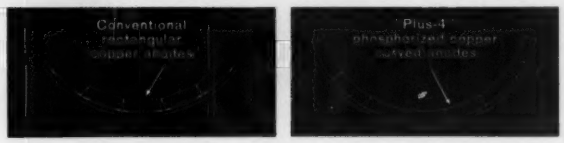
phosphorized copper anodes

in a new form

CURVED ANODES

for plating cylinders faster and more uniformly

To make anode surfaces parallel the rotogravure cylinder being plated, and to fit the curve of the current-carrying slings, Anaconda "Plus-4" phosphorized copper anodes are now extruded to precisely curved shapes.



This design gives both cost savings and improved cylinder quality:

1. A more evenly plated cylinder. Because the distance between the cylinder and the anode surface is more uniform, the copper deposit is smoother and more uniform.

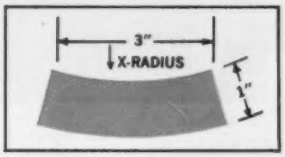
2. Finishing operations in most cases are reduced, as much as 50%, because of the uniform copper deposit.

3. Less scrap because anodes corrode more evenly.

4. Improved electrical efficiency and faster plating because of better contact with sling.

For more information, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 60107

Note: When you request information, please specify inside radius of anode.



"PLUS-4"® phosphorized copper anodes

ANACONDA®

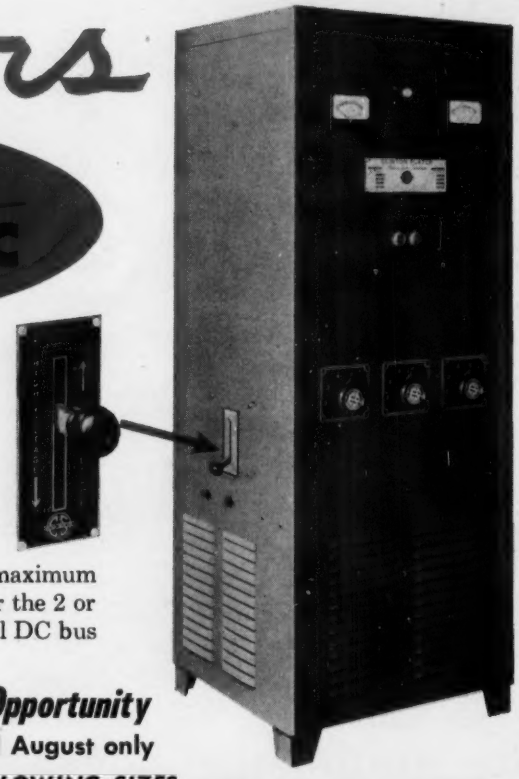
products made by The American Brass Company

Clinton HEAVY DUTY Platers

50th Anniversary Clinton SINCE 1910

WITH DUAL-O-MATIC CONTROL

U. S. PAT. OFF. NO. 660996



The "Dual-O-Matic" Transformer circuit manually operated from the Hi/Lo voltage selector switch was developed and perfected by our Rectifier Research Division. It is used exclusively in rectifiers manufactured by our company.

This new type transformer circuit is revolutionary in design and function as it permits the maximum name plate DC amperes rating to be drawn on either the 2 or 12 volt operating range without reconnecting external DC bus in series or parallel connection.

Our Golden Anniversary — Your Golden Opportunity

15% discount on prices listed below during July and August only

AVAILABLE IN THE FOLLOWING SIZES:

MODEL	DATA	PRICE F.O.B. CHICAGO	MODEL	DATA	PRICE F.O.B. CHICAGO
1012HO2	1000/1000 A 2-6/6-12 VDC	$1,195.00	4012HO2	4000/4000 A 2-6/6-12 VDC	$3,395.00
1512HO2	1500/1500 A 2-6/6-12 VDC	1,445.00	5012HO2	5000/5000 A 2-6/6-12 VDC	4,325.00
2012HO2	2000/2000 A 2-6/6-12 VDC	1,795.00	6012HO2	6000/6000 A 2-6/6-12 VDC	5,065.00
3012HO2	3000/3000 A 2-6/6-12 VDC	2,765.00	7512HO2	7500/7500 A 2-6/6-12 VDC	6,695.00
1018HO2	1000/1000 A 4-9/9-18 VDC	1,748.00	3018HO2	3000/3000 A 4-9/9-18 VDC	3,840.00
1518HO2	1500/1500 A 4-9/9-18 VDC	2,150.00	4018HO2	4000/4000 A 4-9/9-18 VDC	4,875.00
2018HO2	2000/2000 A 4-9/9-18 VDC	2,750.00	5018HO2	5000/5000 A 4-9/9-18 VDC	5,855.00
724HO2	750/750 A 6-12/12-24 VDC	1,865.00	2024HO2	2000/2000 A 6-12/12-24 VDC	3,165.00
1024HO2	1000/1000 A 6-12/12-24 VDC	2,095.00	3024HO2	3000/3000 A 6-12/12-24 VDC	4,665.00
1524HO2	1500/1500 A 6-12/12-24 VDC	2,525.00	4024HO2	4000/4000 A 6-12/12-24 VDC	6,075.00

A. C. Input—3 phase, 60 cycle, 220 or 440 volts. Specify line voltage when ordering.
Above prices include Built-in Voltage Control. Magnetic Starters and all required operating accessories.

DUAL-O-MATIC PLATERS

U.S. PAT. OFF. NO. 660996

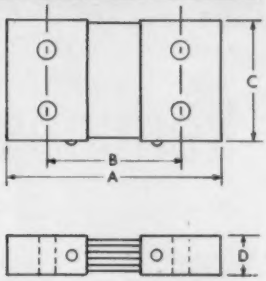
CLINTON SUPPLY CO.

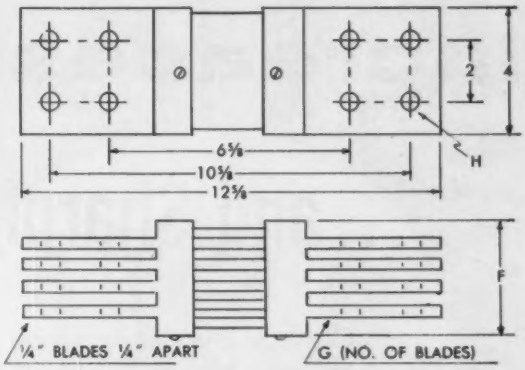
RECTIFIER MANUFACTURING DIVISION

110-112 S. Clinton St. Chicago 6, Ill. Phone FRanklin 2-3538

You can fully rely on *Clinton Shunts*. Design and manufacture are based on over 47 years of application experience, and are job-proved • Each shunt is individually calibrated, and accurately rated • Quality construction of copper and manganin assures uniform current, properly controlled heat distribution, and infinitely long-life service • Large cross-section copper terminal blocks combine rigid mounting supports with ample heat dissipation • Low temperature rise when properly installed in accordance with rated current • Available in standard types listed below, and in other size-ranges and special types.

Accurately Engineered Performance Proved





100—2000 AMPERES 50 MILLIVOLTS

MODEL S-100 SHUNTS					
AMPERES	A	B	C	D	LIST PRICE
100	4⅛	3⅜	⅝	⅜	$6.85
200	4⅛	3⅜	1⅜	½	7.85
300	4⅛	3⅜	1¼	½	8.85
400	4⅜	3⅜	1	¾	10.90
500	5¾	3⅞	2	¾	11.95
750	6½	4¾	2	1	17.50
1000	5¾	3⅞	4	¾	22.40
1500	6¾	4¾	4	1	32.75
2000	6¾	4¾	4	1	35.60

All dimensions in inches

Control the performance of your equipment through Clinton Shunts and Meters

2500—10,000 AMPERES 50 MILLIVOLTS

MODEL L-300 SHUNTS				
AMPERES	F	G	H	LIST PRICE
2500	2	3	2¾	$55.85
3000	2	3	2¾	65.10
4000	3	4	2¾	98.75
5000	3	5	2¾	119.40
6000	4	6	2¾	132.60
7000	4½	7	3¾	160.40
8000	4½	8	3¾	195.50
9000	5½	9	3¾	225.80
10,000	5½	10	3¾	240.60

All dimensions in inches

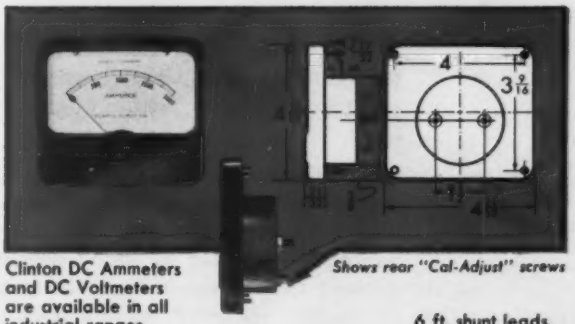
All list prices are subject to trade discount

d'ARSONVAL MOVING-COIL METERS with exclusive Clinton rear screw "Cal-Adjust"

New built-in feature facilitates initial installation, saves you time and cost in re-calibration. Clinton meters give you the d'Arsonval moving-coil design for voltage and amperage measurement in direct current (DC) *plus* exclusive Clinton rear screw "Cal-Adjust".

Simply by turning two screws at the rear of the meter case, you can vary the meter setting by ±2.5 millivolts to compensate far lead lengths, magnetic environment, any type or thickness of panel. This enables you to set the meter accurately against a standard. Once calibrated, Clinton meters maintain their tolerances for long periods. Meter accuracy: 2% full scale. Zero setting screw on front of meter case.

Quality construction includes precision-polished jewel bearings, accurately machined pivots, fatigue-tested springs, and stress-relieved assembly. Spade-type meter pointer and easy-to-read numerals are designed for clearer, faster reading.



Shows rear "Cal-Adjust" screws

Clinton DC Ammeters and DC Voltmeters are available in all industrial ranges
List Price, $12.50

6 ft. shunt leads.
List Price, $1.50

CLINTON SUPPLY CO.
RECTIFIER MANUFACTURING DIVISION
110-112 S. Clinton St. Chicago 6, Ill. Phone FRanklin 2-3538

DUAL-O-MATIC PLATERS

DRAMATIC ELECTROCLEANING METHOD cuts costs, increases production

...and Sharply Reduces Rejects!

Combine the speedy action of Diversey No. 15 Soak Cleaner and Diversey No. 35 Electrocleaner and watch production rates rise and cleanliness climb to an all time high. This double-treatment results in more adherent plate. Rejects reduce to a minimum. Per unit costs go down.

Here's the application that could well create a new peak along your high speed production lines:

DIVERSEY NO. 15 HEAVY DUTY SOAK CLEANER

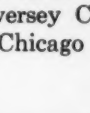
High speed removal of oily contamination • thorough emulsification • exceptional wetting action.

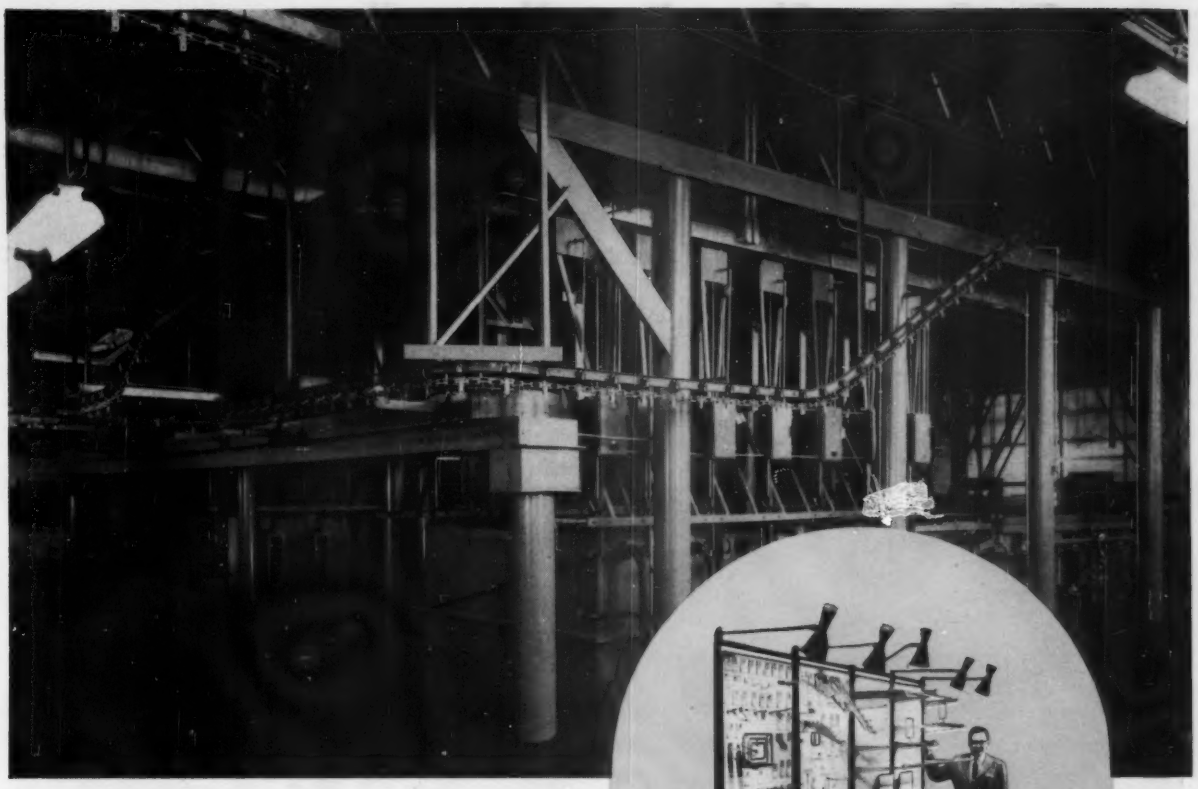
DIVERSEY NO. 35 HIGH CONDUCTIVITY ELECTROCLEANER

Maximum conductivity . . . permits full loading of racks • produces water break-free, smut-free surfaces, even in low current density areas.

Maintenance savings, too. Both cleaners deliver a new high in contamination tolerance for long solution life. And their advanced type water softening properties prevent hard precipitates from forming on tanks, reducing maintenance and down-time.

Get the facts now on the new cleaning combination that can give you better plating at less cost. See your Diversey D-Man or write Metal Industries Department, The Diversey Corporation, 1820 Roscoe Street, Chicago 13, Illinois.

DIVERSEY. 



how CROWN "MP" increased production and efficiency at REFLECTOR HARDWARE*

The Crown "M-P" is the most versatile automatic processing machine to be found. It is not unusual for several dissimilar jobs to be in process simultaneously . . . for example, two or three different metals can be plated in racks or barrels at two different voltages. The "M-P" handles an astonishing range of sizes and weights . . . parts from ¼-inch to 40-feet; from fractions of an ounce to 1½-tons can be processed at each station. The machine illustrated processes over 5000 *different items.* The key to "M-P versatility is a control system far in advance of any similar equipment. If you have a continuous dipping process, find out what Crown automation can do for you . . . write for Bulletin "M-P" today!

Mr. Robert A. Abrahamson,
Plant Superintendent
REFLECTOR HARDWARE CORPORATION

says: "With modern automation of our nickel, chrome and cadmium processing, we are able to monitor production to keep up with our tight delivery schedule. The Crown "M-P" has also improved quality, speeded production and cut costs . . . it all adds up to a general efficiency gain that makes this machine a very profitable investment."

*WORLD'S LARGEST MANUFACTURER OF METAL MERCHANDISING EQUIPMENT

CROWN

CROWN RHEOSTAT and SUPPLY COMPANY

1965 PRATT BOULEVARD • ELK GROVE VILLAGE, ILLINOIS • (A SUBURB OF CHICAGO)

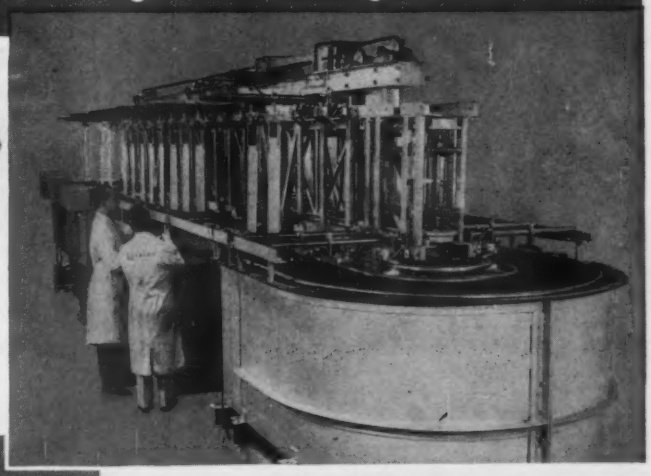
"T" BONE NICKEL ANODES offer you 40% MORE AREA PER POUND OF ANODE THAN OVALS!

WEIGHT: 1 lb., 3 oz. per inch
LENGTHS: From 3" to 103"

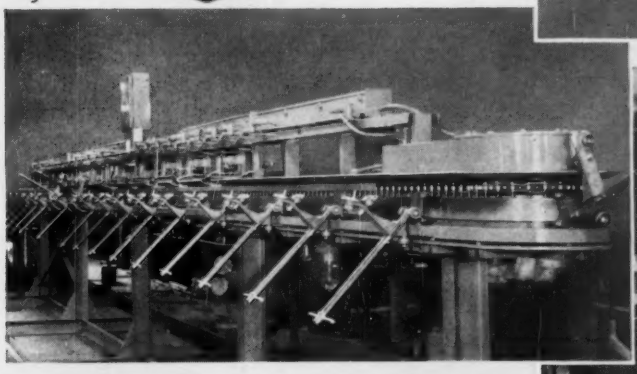
UNIVERTICAL CORPORATION
14841 MEYERS ROAD • DETROIT 27, MICHIGAN
BRoadway 3-2000

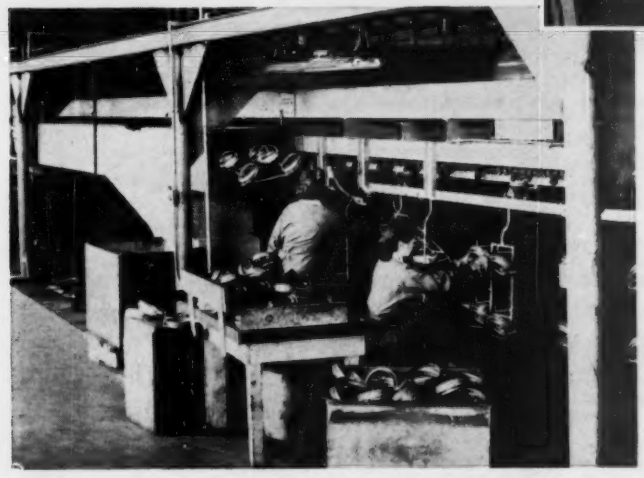
LASALCO has an automatic for any plating or anodizing operation!

CYCLEFLEX Full Automatic Plating & Anodizing Machine.
Most versatile of all automatics! No overhaul or rebuilding to switch cycles—just a simple moving in positions of pick-up heads and minor changes in tank partitions. Safety controls prevent conveyor breakdowns and load dropping. Many adaptations for any requirement. Low headroom.



SELECT-O-MATIC Multiple Process Plater.
Handles 2, 3 or more process cycles at one time! While loading, operator merely turns dial to select desired cycle for individual racks and the rest is fully automatic! One operator can handle several different processes simultaneously. Saves investment in a variety of machines—reduces floor space requirements—cuts maintenance to a minimum.





DAW JUNIOR CONVEYOR
Fully automatic handling of individual parts. Tailor-made for any production output and any cycle. Tank to tank work transfers raise carriers to above horizontal to prevent solution carry-over, and eliminate air or gas pockets in work. Automatic unloading if work permits.

DAW SENIOR CONVEYOR
Custom-engineered, fully automatic, for any job, any cycle, any production requirement. Transfers from one tank to another raises work from vertical to above horizontal to facilitate drainage, prevent solution dragout. Handles racks for all sizes and quantities of parts. Automatic unloading unless shape or work size is too large.

Write For Descriptive Literature

● Lasalco has the sound experience and proved ability to analyze your exact needs, and to give you equipment that will increase output do it better, faster, and far more profitably. Phone or write for the services of a Lasalco engineer.

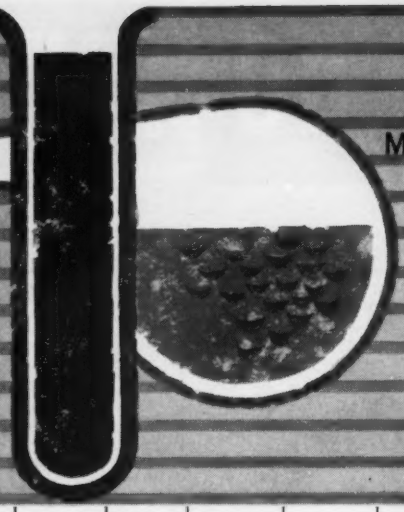
LASALCO, INC.

HOME OFFICE: 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
IN TEXAS: 2805 Allen Street • Dallas, Texas • Riverside 7-5814

EFFECTIVE

Pfizer

CHEMICALS FOR METAL FINISHING



PLATING
DE-RUSTING
METAL CLEANING
ALUMINUM ETCHING AND COLORING

	Cleaning	Polishing	Pickling	Electroplating	Electropolishing	Non-Electrolytic Depositions	Electrolytic Oxidation	Etching	Gold Coloring of Aluminum
Citric Acid	✓	✓	✓	✓	✓	✓	✓	✓	
Sodium Citrate	✓	✓		✓		✓			
Ammonium Citrate	✓	✓	✓	✓					
Gluconic Acid	✓	✓	✓	✓				✓	
Glucono Delta Lactone	✓	✓	✓	✓				✓	
Sodium Gluconate	✓	✓		✓				✓	
Oxalic Acid	✓	✓	✓	✓	✓		✓	✓	
Ammonium Oxalate	✓	✓		✓					
Ferric Ammonium Oxalate									✓
Tartaric Acid	✓		✓	✓				✓	
Tartar Emetic				✓					
Rochelle Salt			✓	✓					
Cream of Tartar	✓			✓					

Citric Acid...
Nontoxic, mild, yet chemically active against scale and tarnish. Used extensively in the formulation of general metal cleaners and polishes, particularly household products.

Sodium Citrate...
A preferred ingredient in electroless nickel baths, resulting in a brighter plate. Also finds wide use in electroplating processes.

Ammonium Citrate...
Especially useful for the removal of rust in near neutral solutions. Extremely mild and safe to handle.

Gluconic Acid...
An excellent sequesterant in alkaline derusting solutions; provides rust-free, clean surface ready for further treatment. Also highly effective in aluminum etching and paint stripping compounds.

Oxalic Acid...
The most effective chemical for use in automobile radiator cleaners. Also finds wide use in electropolishing and as an ingredient in general metal cleaners.

Ferric Ammonium Oxalate...
Used extensively in the production of light-fast gold colored aluminum.

Tartaric Acid...
Excellent complexing agent for copper in electroplating.

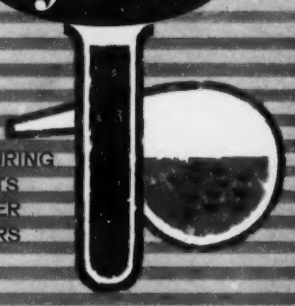
Tartar Emetic...
Used in electrolytic baths for deposition of silver and antimony alloys on brass, copper and steel surfaces.

Rochelle Salt...
Increases efficiency and yields finer-grain deposit in alkaline copper plating.

Cream of Tartar...
An excellent additive for brass cleaning compounds. Its crystalline structure acts as an effective abrasive in paste polishes. Chemically active against tarnish.

SCIENCE FOR THE WORLD'S WELL-BEING...

Pfizer



MANUFACTURING CHEMISTS FOR OVER 100 YEARS

Chas. Pfizer & Co., Inc.
CHEMICAL SALES DIVISION
630 Flushing Avenue, Brooklyn 6, N.Y.
Branch offices:
Chicago, Ill.; Clifton, N. J.; San Francisco, Calif.;
Atlanta, Ga.; Dallas, Tex., Montreal, Canada

Two New Heavy Duty Portable Filters by Industrial

CORROSION RESISTANT

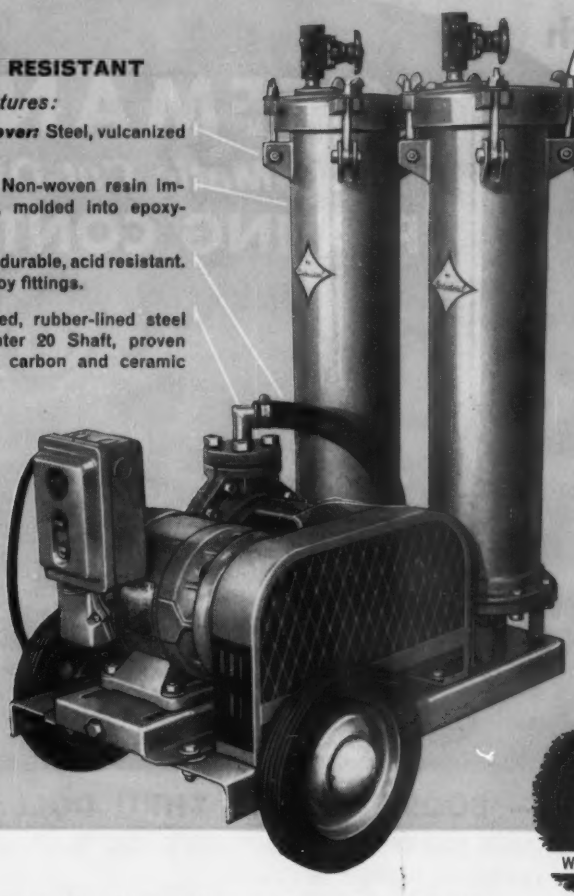
Note these features:

Chamber and Cover: Steel, vulcanized rubber lining.

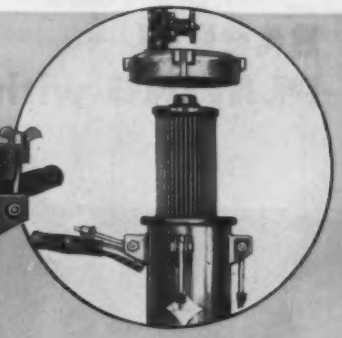
Filter Element: Non-woven resin impregnated fabric, molded into epoxy-phenolic ends.

Hose: Three ply, durable, acid resistant. Plastic or Hastelloy fittings.

Pump: Vulcanized, rubber-lined steel chamber. Carpenter 20 Shaft, proven mechanical seal; carbon and ceramic components.



1200 GPH



EASY TO CLEAN

Flip-top cover lifts off. Pull-out cartridge can be replaced or rinsed and reused in seconds.

100% PORTABLE

Mounted on two 6" dia. wheels. Full swivel rear coaster insures complete ease of movement.

COMPACT

Is complete filtration *system:* suction and discharge hose, ball check foot valve strainer; motor with thermal overload starter, filter element(s) and pump . . . yet requires only 6 sq. ft. of floor area. You simply plug it in . . . and start filtering, anywhere.

WORKHORSE OF THE INDUSTRY

Now you can eliminate the time and expense of bothersome repiping and the need and equipment for separate plating solution filtering stations.

The new type 118 *heavy duty* Industrial filters are rugged, but compact; low in cost but typically *Industrial*-engineered and rubber-lined throughout for corrosion resistance. The heavy duty *Industrial* pump is of the same long proven design employed in hundreds of *Industrial* filters now in plating service.

Look at the features . . . look at the specs . . . look at the *work* capacity. You can get this complete, proven-dependable filtration system in but six *portable* square feet of work area.

WRITE FOR BULLETIN 118.

TWO MODELS AVAILABLE

Single tube 600 gph capacity, is convertible to double tube 1200 gph capacity model shown above.

600 GPH

CHECK THE SPECS:

- 600 and 1200 gph capacity
- 15 and 30 sq. ft. filtration area
- Temperatures to 170° F.
- Unit 50 P.S.I.G. operating pressure
- Fully proven in plating use

INDUSTRIAL FILTER & PUMP MFG. CO.

5906 Ogden Avenue, Cicero 50, Illinois

INDUSTRIAL

P-659

20% MORE PROFITS

FROM YOUR
BARREL
PLATING with

HOFFMAN

DC-Matic Cut-Off
PLATING CONTROLS

"Saved nearly $400 a year in cadmium alone," says plater. "Boosted production 20% while saving about 300 lbs. of cad and well over 100 plating hours." (details on request)

BEAT THE "TIME" JINX – BOOST PROFITS THRU DOLLAR SAVINGS

HOFFMAN DC-MATIC PLATING CONTROLS WILL AUTOMATE YOUR TIMING AND PERMIT YOU TO MEET TODAY'S TOUGHEST DEMANDS FOR CONTROLLED, OPTIMUM PROCESSING.

FASTER, SAFER, LOWER COST OPERATIONS FOR YOUR TANK LINES AND AUTOMATICS

Boost Production 20%. Improve Quality
Eliminate rejects from over or under plating. More volume. Combine visual and electrical control for overall optimum efficiency.

Cut Costs of Materials and Labor
You'll save metals, electricity, and manhours amounting to hundreds of dollars.

Simplify Operations
Eliminate timing errors, guesswork. Stop continuous "policing" and riding herd on multi-processing. Automatic Cut-Off does it for you.

Safeguard Operators
No more arcing, explosions, or splashing solutions while changing cylinders. Current automatically cuts off before change, cuts on after change.

Protect Equipment
Prolong service life. Contacts stay cleaner; reduce maintenance, excessive wear.

Quick Returns
Timers and controls practically indestructible; no maintenance, no wearing out. Pay for themselves—within a few months.

Easily installed at low initial cost, they pay for themselves with the first few jobs. Your own cost figures will prove it. Hoffman-equipped plants verify it.

Simply turn "on" plating current by pre-setting Timer to exact time-period for optimum results and forget it.

Supervision maintains detailed status of all processing at a glance. Total advantages are immediately realized, and continue throughout use of system for years on end. Benefits are multiplied in direct proportion to units applied and volume of plating.

Guaranteed for 1 year against defects and failure while operating within limits of manufacturer's specifications.

Model	Amps	Volts
A-1	600	5 to 8
A-2	600	9 to 15
B-1	1000	5 to 8
B-2	1000	9 to 15

Install yours now and watch your profits grow.

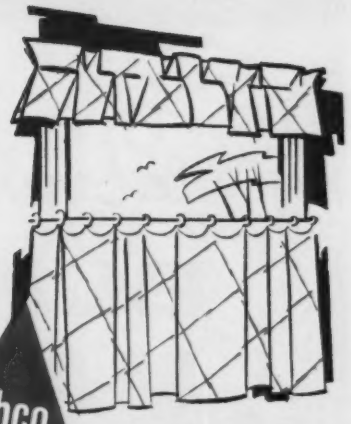
Order your Hoffman Controls by model number, amps. and volts. State either built-in or separate Timers.

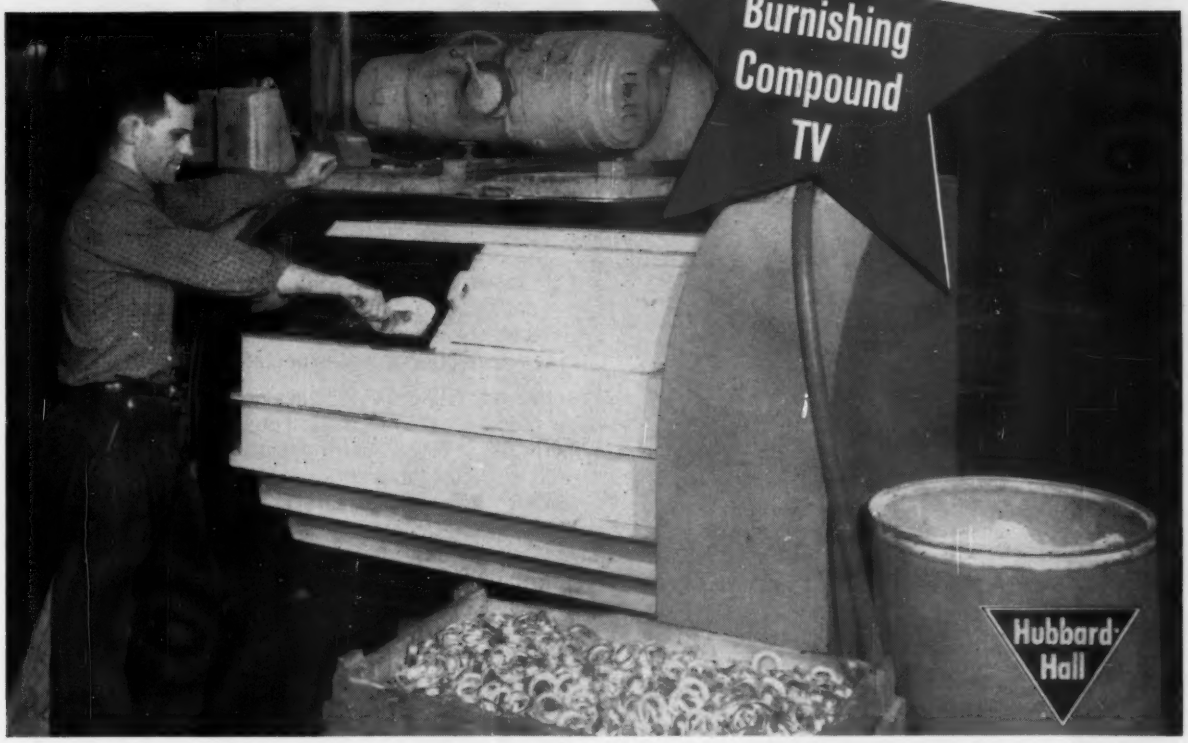
HOFFMAN CONTROL CO.

6804 PARK AVE. **CLEVELAND 5, OHIO**

Michigan 1-3512

Giving Stanley-Judd's drapery hardware its *"Gleam of Gold"*





These brass-plated pole sockets — like Stanley-Judd's cafe rings, cafe brackets and other drapery hardware — have to sell on sight. They need superior gloss, brightness and color . . . in short, Stanley-Judd's famous "Gleam of Gold". They get it with Ahco Burnishing Compound TV, the choice of Stanley-Judd* finishers after years of testing burnishing compounds on their brass and brass-plated steel products. This new Ahco Compound is also ideal for burnishing copper or steel. It leaves no film on the work and it may be used in all conventional types of burnishing equipment, with all types of media.

Another new Ahco development, for use on ferrous metals, is Burnishing Compound CP-2 which removes light rust or scale as it burnishes. And there are many many more in the complete Hubbard-Hall line of burnishing compounds for *all* applications, *including yours*. It costs you nothing to find out what the right Ahco Compound can do for you. Just drop us a line about your application . . . the burden of proof is on us. At least, let us send you our latest bulletins.

* a division of The Stanley Works

THE Hubbard-Hall CHEMICAL CO.

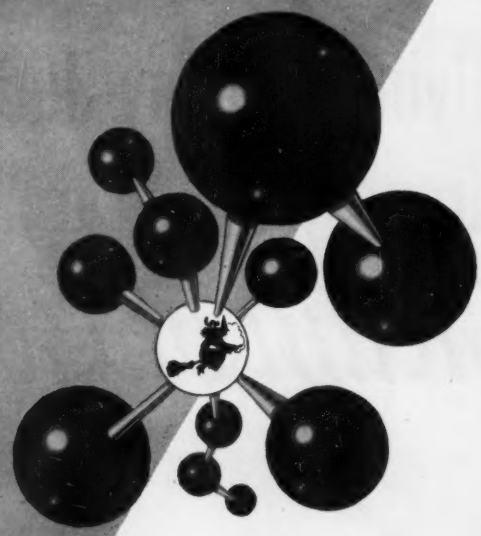
Waterbury, Conn.

APOTHECARIES HALL DIVISION

"ACTIVATED"

BLACK MAGIC

(Pat. Pending) ®



An Innovation in BLACK OXIDE PROCESSING

Here is another "Successful First" in the black oxide finishing field, from the research and development laboratories of Mitchell-Bradford. This outstanding black oxide process for steel has been thoroughly tested and proven for the past several months and is now being used by a large number of manufacturers and commercial applicators. It is performing above our highest expectations.

"Activated" BLACK MAGIC is a new approach to a black oxide process because of its constant, automatic, self-regenerating, decontaminating, catalytic action along with other vitally important and unusual characteristics. "Activated" BLACK MAGIC contains entirely new concepts of activators, catalysts, penetrants and rectifiers. This produces the following outstanding advantageous results in operation, processing and final resultant black finish.

When you use "Activated" Black Magic you get the following advantages:

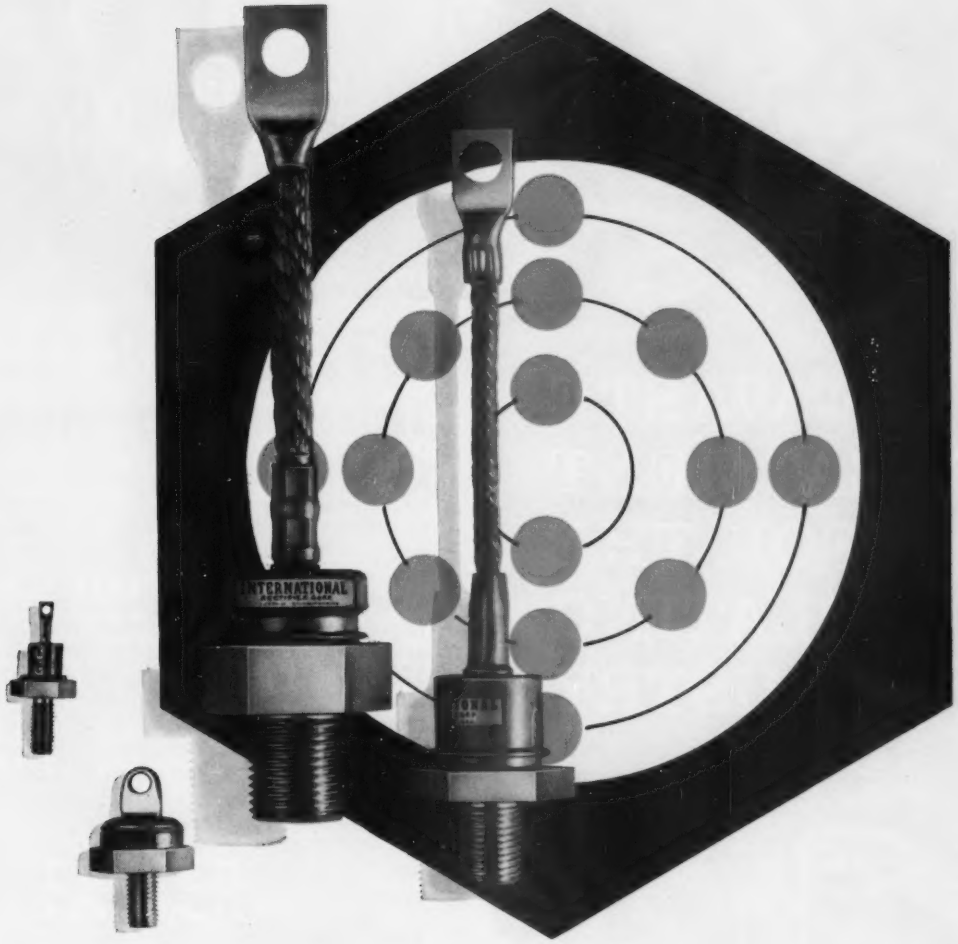
- Incorporation of the newest available products of chemical research in activators, catalysts, penetrants, inhibitors, and rectifiers.
- More Corrosion and Abrasion Resistance.
- Shorter Blackening Cycles — More Uniform Finish.
- Latest and Unique Method of Self-Rectification.
- Hardened (heat-treated) parts blackened more easily and uniformly.
- Single Bath — One Chemically Balanced Salt.
- Low Operating Temperature — Lower Cost of Operation.
- Meets or Surpasses all Military, Aeronautical or Civilian specifications.

Mitchell-Bradford

THE MITCHELL-BRADFORD CHEMICAL CO.

Wampus Lane Milford, Conn.

QUALITY PRODUCTS OF CHEMICAL RESEARCH



THESE ARE THE SILICON POWER RECTIFIERS
THAT MAKE THE BEST EQUIPMENT EVEN BETTER!

Produced for leading equipment manufacturers by

INTERNATIONAL RECTIFIER CORPORATION

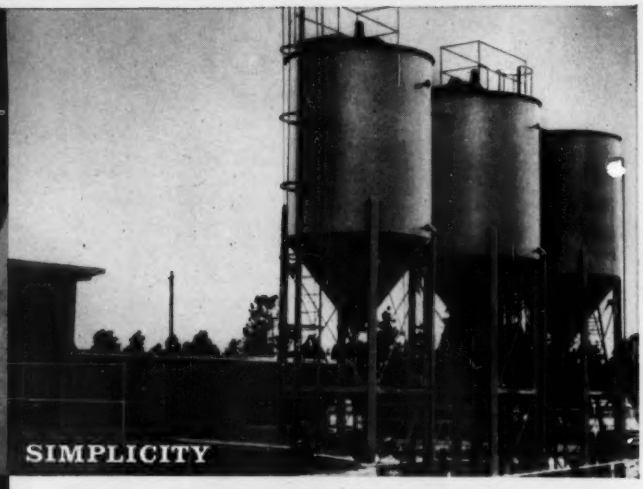
World's Largest Supplier of Industrial Rectifiers...

Offices and representatives located throughout the world.

HIGH VOLTAGE
ELECTRO CHEMICAL
VOLTAGE REGULATION
COMMUNICATIONS
INDUSTRIAL POWER
COMPUTERS AND CONTROLS

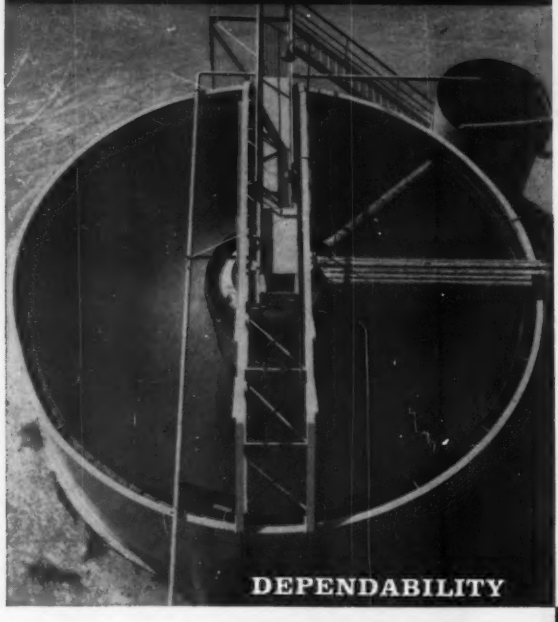
International Rectifier Corporation Executive Offices: El Segundo, California

SAVINGS



SIMPLICITY

IN WASTE TREATMENT FOR THE PLATING INDUSTRY



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SAVINGS • SIMPLICITY • DEPENDABILITY

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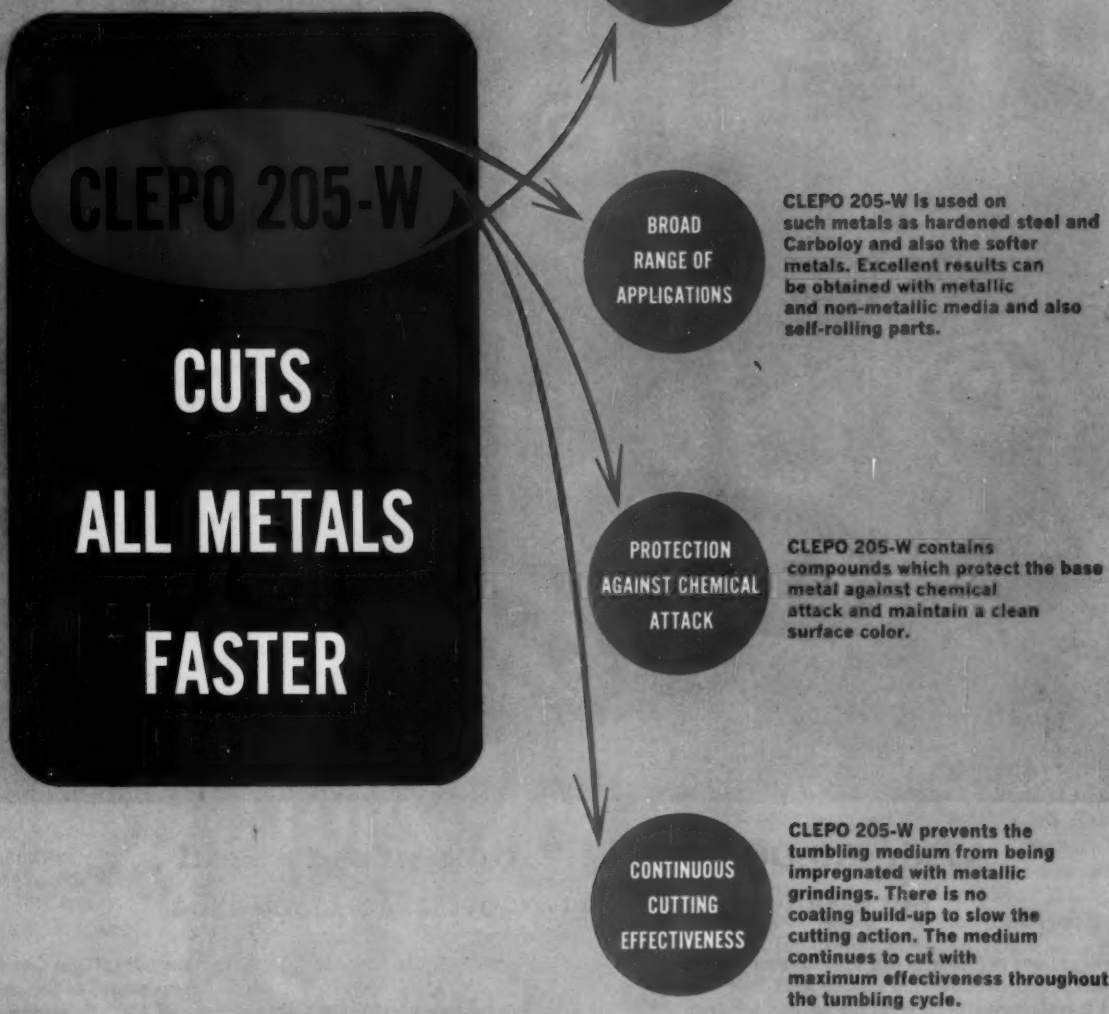
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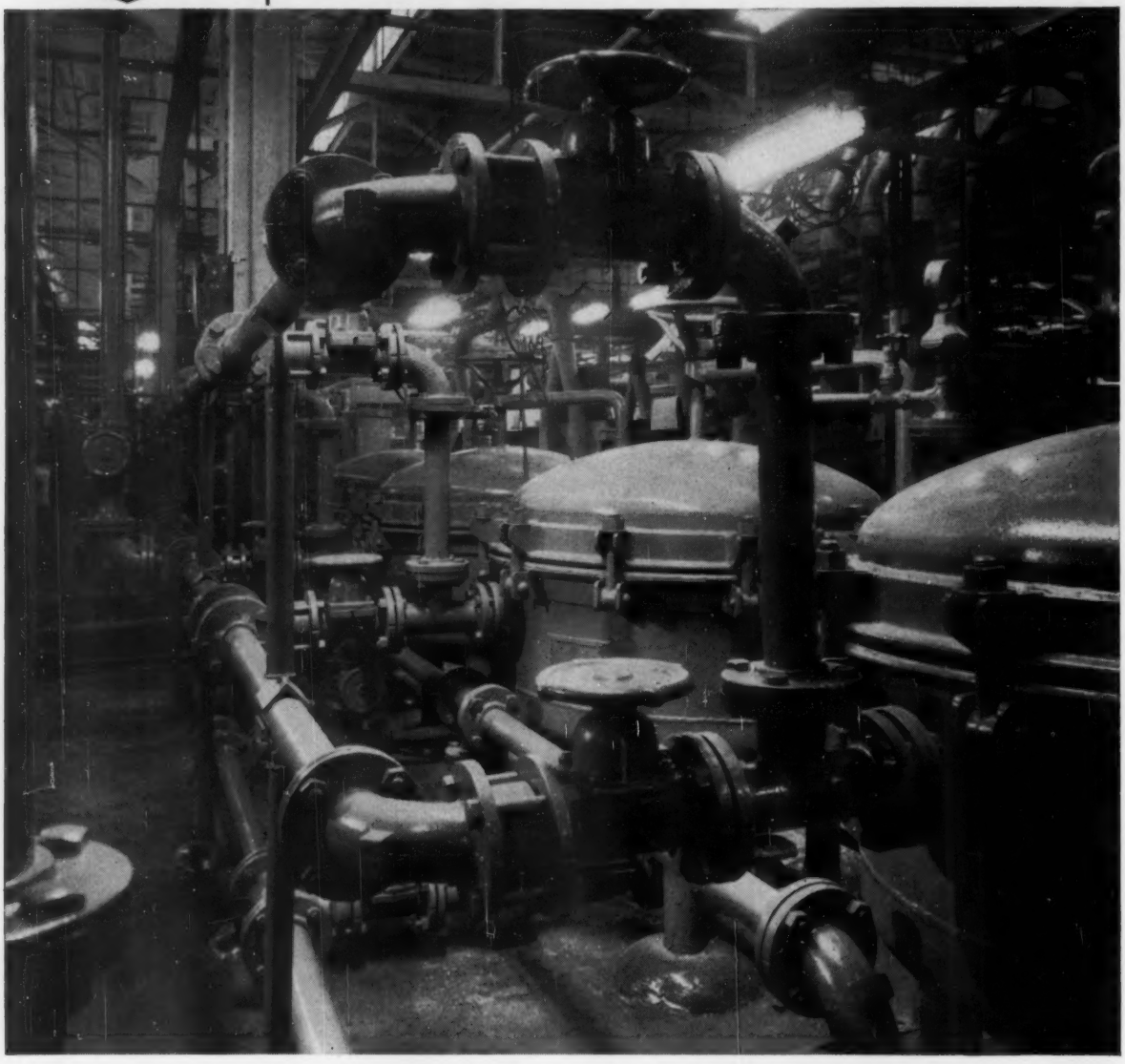

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not a failure in 5,000 feet of Saran Lined Pipe

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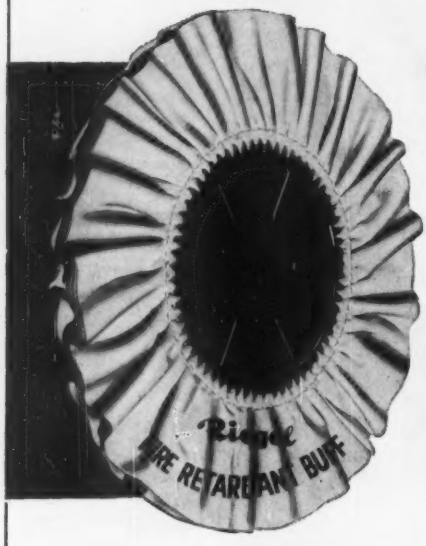

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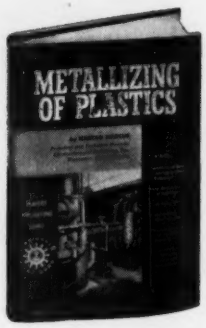

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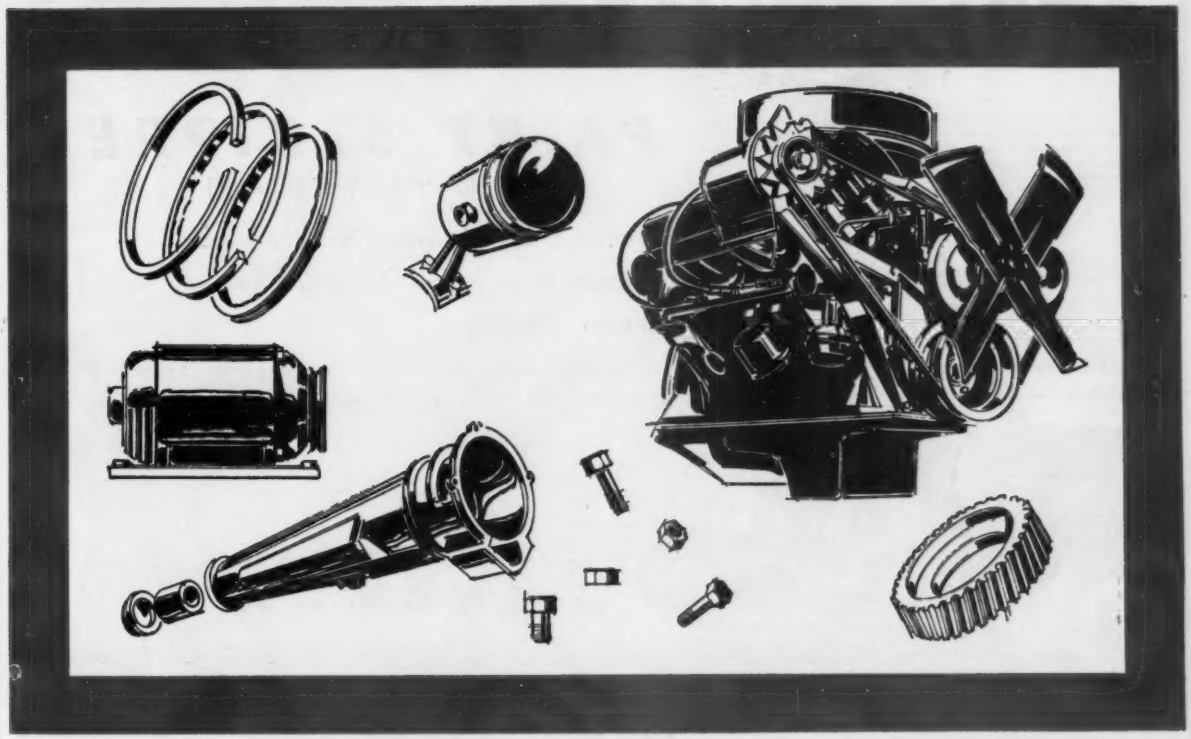

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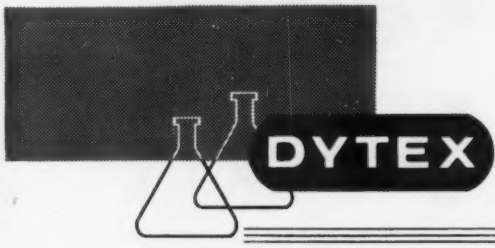

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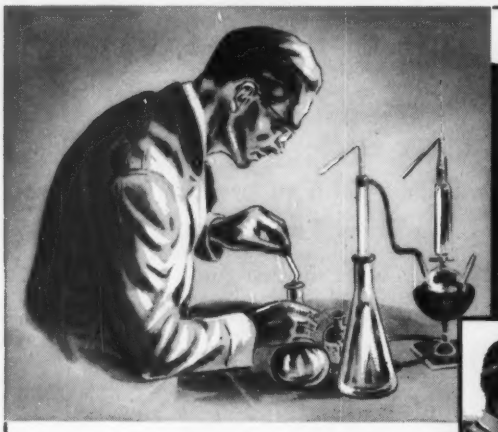

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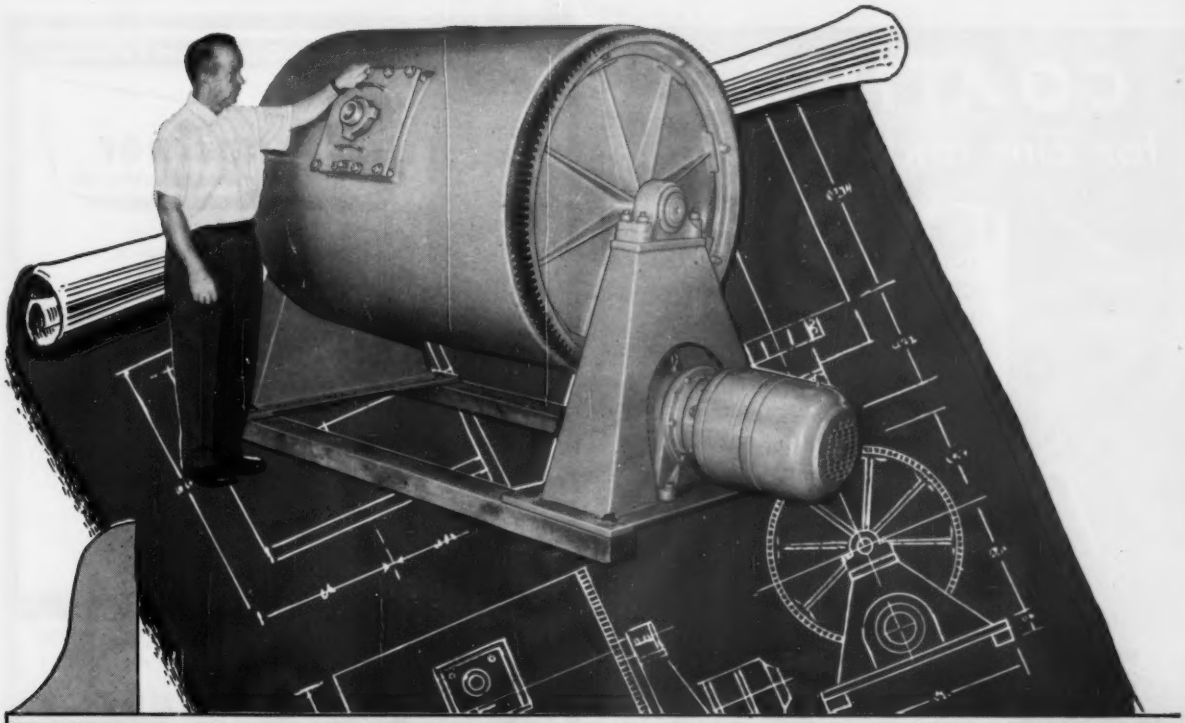

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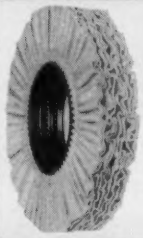

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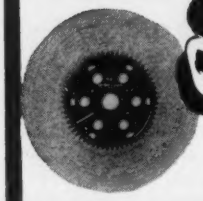

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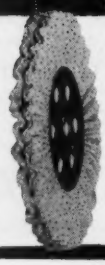

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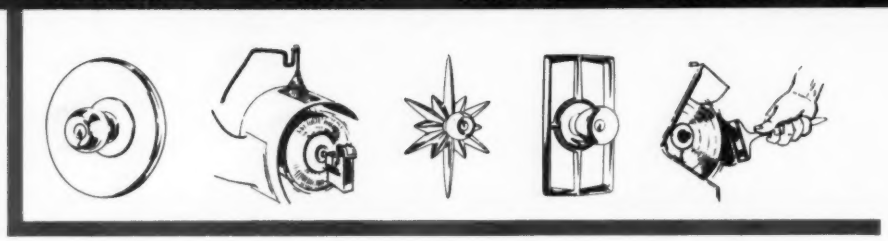

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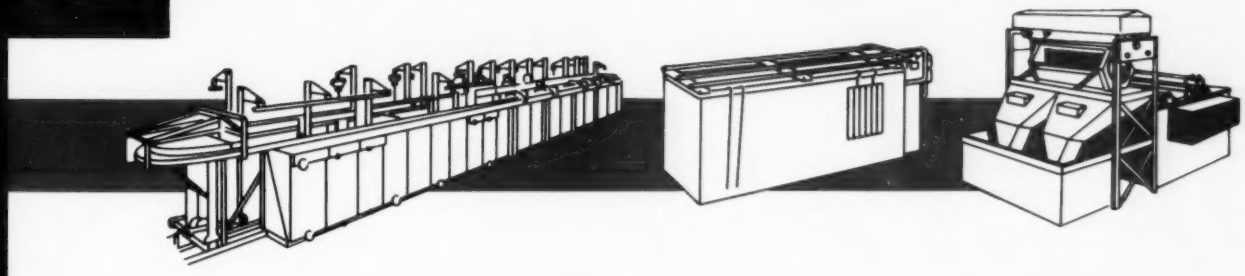

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PRQ-LEVEL — Q-Level process designed for operation with periodic reverse current.

Q-STRIKE — A cyanide copper strike that produces a superior foundation for subsequent copper and nickel deposits.

CYANIDE COPPER ADDITION AGENTS — for use with any type cyanide copper.

CW-7 WETTING AGENT — a wetting agent with high degree of stability. Increases tolerance of bath to organic contamination; benefits anode corrosion.

SUPERTARTRAL — exceptionally effective addition agent for cyanide copper baths; aids anode corrosion, reduces cyanide breakdown.

LR-1 — chrome reducer. Particularly effective in copper strikes and plating baths where chromium contamination is high.

TST — a purifier for all copper baths and strikes contaminated with zinc and chromium.

ACID COPPER PROCESSES

CUPROTYPE — smooth, tree-free heavy deposits at high speed. Proven for electronic use (printed circuitry etc.), electrotyping, electroforming, etc.

COPPER-GLEAM — brilliant deposits with exceptional leveling characteristics.

LEA-RONAL NICKEL PROCESSES

NICKEL-GLEAM N-222 — ductile deposits, with exceptional leveling characteristics, high throwing and covering power. Same solution operates with air or mechanical agitation.

NICKEL-GLEAM N-1 — bright all purpose type of bath, exceptional tolerance to impurities, very active nickel surface. A true workhorse nickel bath.

NIKAL PC — a controlled stress nickel for printed circuitry and allied electronic industry uses.

NICKEL-GLO "C" — a bright cold barrel addition agent simple to operate.

NICKEL-GLO "BA" — a hot bright high speed barrel process. Produces heavy ductile bright deposits.

LEA-RONAL GOLD PLATING PROCESSES

AURO GLO 4 — an acid type bright ductile, easily controlled gold process; designed for electronic and allied uses. Hard, porosity free bright deposits.

AURO GLO 12 — a modification of Auro Glo 4 where hardness of 350-400 Knoop is desired. Produces Hamilton colored shade, ideal for jewelry and allied uses.

AURO GLO HS — a *neutral*, zero free cyanide, bright high speed process. Rates of deposition of 0.003" per hour readily obtained from a low concentration bath.

AURO GLEAM 24.00 — an entirely different acid type bath producing *100% pure bright* gold deposits — no alloying elements.

LEA-RONAL BRASS PROCESSES

BRASS-GLO — uniform lustrous deposits over a wide current density range. High speed lustrous deposits with ease of control — for still tank operation.

BRASS-GLEAM — a lustrous high speed hot barrel type solution. Produces uniform color over wide range.

LEA-RONAL BRIGHT SILVER

SILVER-GLO — produces bright, hard tarnish-resistant deposits at high rates of speed from crystal clear solution. For industrial or decorative uses.

LEA-RONAL BRIGHT ZINC

— a bright zinc for barrel and still operation. Stable brighteners have long staying power.

LEA-RONAL BRIGHT CADMIUM

— a bright protective cadmium electrodeposit for use on both ferrous and non-ferrous metals.

WATERSHED

— liquid rinse aid which promotes free rinsing and fast drying, hence reduces staining and spotting of plated pieces.

CHROMESHED

— a powdered water soluble material which reduces and ties up hexavalent chromium in rinse tanks and cleaners.

PRODUCT WDL-1

— a water displacing liquid which offers a simple economical means of drying plated work.

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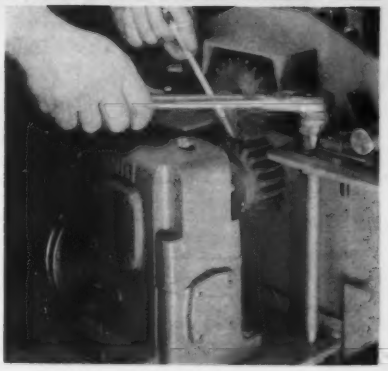

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(Inset, top) G-S 3-Speed Drive Unit slides easily into channels on tank.

(Middle) Simple belt adjustment on pulleys for any one of 3 speeds.

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For low cost, cut-color operations it will pay you dividends to investigate this super-flexible Churchill Buff #501 . . . for all standard jobs **PLUS** those special jobs that give bias-type buffs trouble.

• *Churchill Finger-Buffs* are competitively priced. Produced in all sizes from 3" to 21" diameters. For complete information write your problem.*

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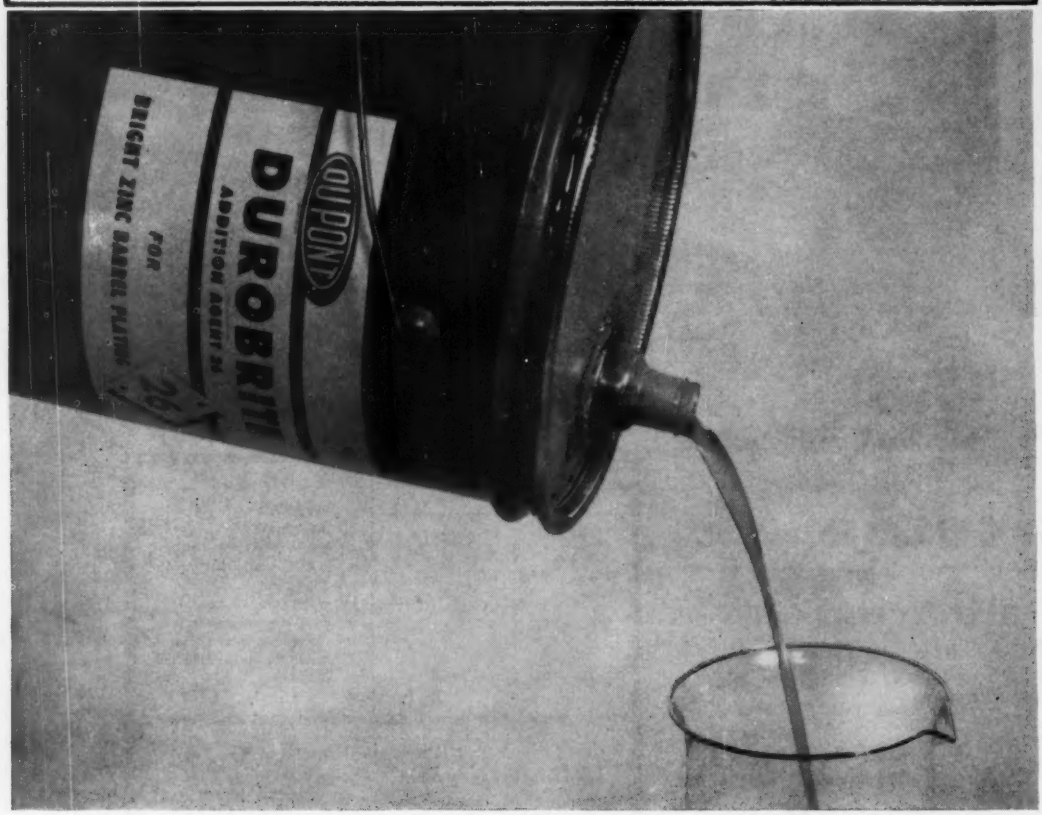
ADDITION AGENT 26



Flexible polyethylene spout permits easy pouring and measuring . . . pops back into metal drum when not in use.

a high-performance brightener

Du Pont's "Durobrite" Addition Agent 26 is a new liquid brightener specially developed for high-quality barrel zinc plating . . . offers you these advantages:

EXCELLENT STABILITY. "Durobrite" Addition Agent 26 stays effective longer. It produces bright plates even at bath temperatures as high as 110°F. Brightening effectiveness continues during idle periods so there's no need to add large amounts of brightener after weekend shutdowns. Decrease in brightening activity in the bath is gradual . . . minimizing rejects and the necessity of reprocessing parts.

NO BRIGHT DIPPING. You can obtain any predetermined degree of brightness—up to full liquid brightness—without bright dipping.

LOW USE COST. Extensive field tests indicate that the high stability of "Durobrite" Addition Agent 26 makes it economical to use . . . you use less brightener and plate more parts.

CONVERSION COATINGS. Deposits are highly suitable for use with chromate conversion treatments.

CONVENIENT LIQUID FORM. An easy-to-use liquid, "Durobrite" Addition Agent 26 may be added to the bath "as is" or as a diluted stock solution.

HANDY CONTAINER. Convenient polyethylene-lined metal container (40 lb. net) has handy utility spout which allows easy pouring and measuring (see above). Spout pops back into container for easy storage.

High-quality brightness and excellent coverage are obtained with new liquid "Durobrite" Addition Agent 26.

...for barrel zinc plating

Other Brighteners in Du Pont's Plating Chemical Line. "Durobrite" Addition Agent 26 rounds out Du Pont's complete line of high-quality zinc brighteners:

"DUROBRITE" ADDITION AGENT 309—An extremely economical brightener (liquid form) for cyanide zinc solutions. Small amounts give a bright, uniform, lustrous plate.

"ZIN-O-LYTE" BRIGHTENER—Widely used powder form... gives brilliant blue-white zinc plating without bright dipping.

"ZIN-O-LYTE" SPECIAL—An economical brightener (powder form) for barrel plating that gives bright deposits without bright dipping.

Whatever your requirement may be, Du Pont zinc-plating brighteners will give you bright, uniform deposits of the finest quality. For more information on new "Durobrite" Addition Agent 26 or other Du Pont brighteners, call your nearest Du Pont distributor or district office, or write: Du Pont, Electrochemicals Department, Sodium Products Division, Wilmington 98, Delaware.

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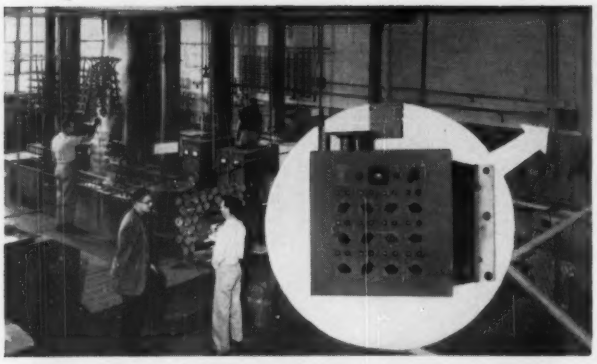

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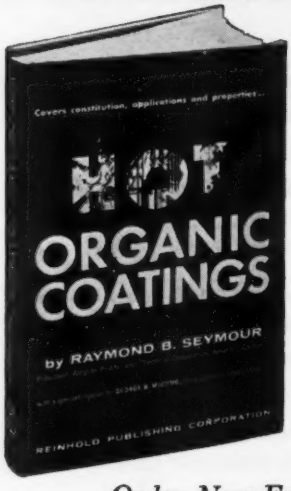
Covers constitution, applications and properties.

HOT ORGANIC COATINGS

by RAYMOND B. SEYMOUR
President, Alcylite Plastic and Chemical Corporation
With a special chapter by GEORGE B. McCOMB
Consultant to Suppliers of Pipe Line Coatings

1959, 244 pages, $7.50

The constitution, applications and properties of hot organic protective coatings are concisely presented here. The book contains chapters on widely used hot organic materials such as asphalt, coal-tar pitch, petroleum waxes and cellulose derivatives. Specific information on formulations of proprietary products is included. Additional chapters deal with hot melt applications without solvent such as peel coatings, protective linings, flame spraying and the fluidized bed process. One chapter on hot applied coal tar pitch base coatings is supplied by George B. McComb, consultant to the leading suppliers of pipe line coatings. Hot spray techniques and the many advantages of this application are also covered. This book will be helpful to everyone using these coatings in any form.



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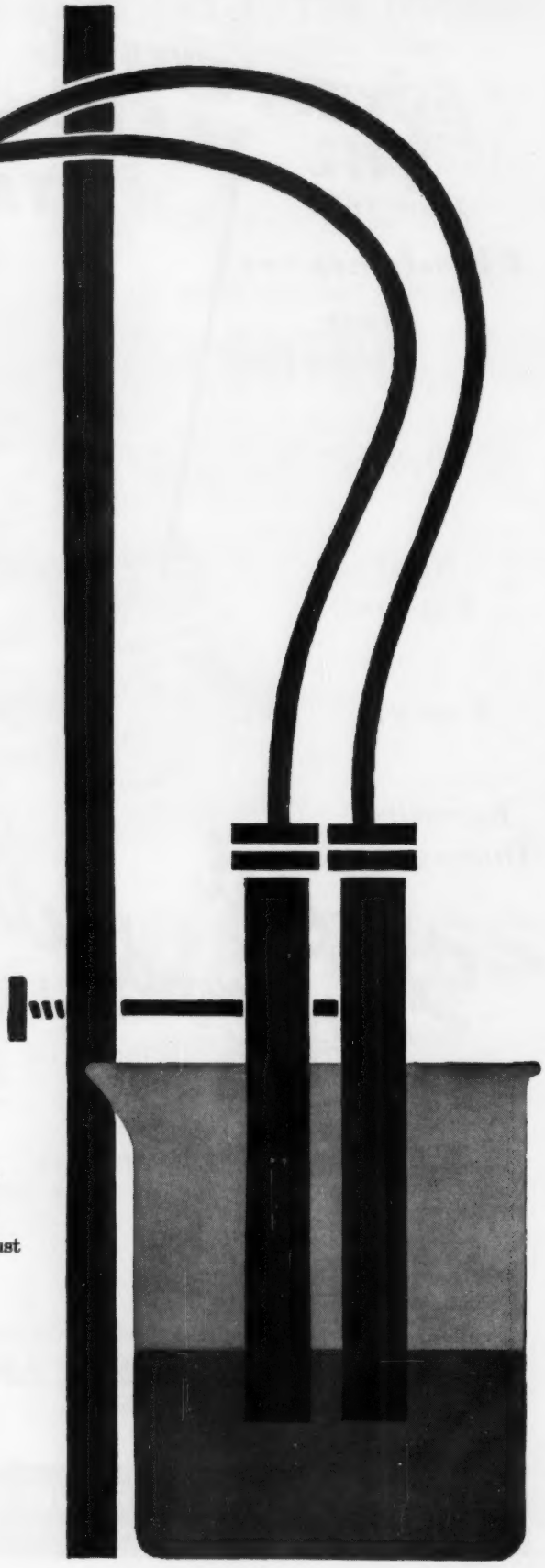

pH 7

some facts about the first truly neutral, high performance trichlorethylene

Columbia-Southern's improved Trichlor makes your job easier, your cleaning better and your costs lower.

Here are the facts:

Longer life and greater stability—proved by actual operation.
Result: Lower cleaning costs—more metal degreased per pound of Columbia-Southern Trichlor.

Rugged stabilization—helps prevent contaminant break-down.
Result: Lower maintenance costs—less sludge formation and longer operating time between clean-outs.

Alkalinity—closer to neutral than any other degreasing trichlorethylene.
Result: Better control in alkaline sensitive operations.

High acid acceptance—highest average acid acceptance of any commercially available trichlorethylene.
Result: Greater protection against acid contaminants.

pH Control—less pH variance in operation.
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Result: No losses from copper tarnishing.

Compatibility—compatible with other trichlorethylenes.

Extensive field testing proves that Columbia-Southern's truly neutral trichlorethylene is adequately stabilized for the most critical degreasing operation. Want to see just how this new Columbia-Southern Trichlor can improve your operation? Contact your Columbia-Southern Representative.

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get

the straight answers to your questions about M&T "Duplex Chromium," SRHS® Chromium and other processes described on following pages

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CHROMIUM PLATING

Unichrome SRHS® Chromium. When introduced, this process marked the first big breakthrough in chromium plating. It plates up to 80% faster than ordinary chromium. Self-regulating important constituents of the bath, it maintains optimum plating balance for consistent results...simplifies control. It reduces rejects and rack costs through wider bright plate range, and excels for plating bright chromium on chromium or stainless steel.

Industrial Crack-Free Chromium. This process provides a ductile, matte deposit free from corrosion-admitting cracks. It also has excellent resistance to impact, abrasion and thermal shock, opening new applications for the plater where ordinary chromium falls short.

Bright Crack-Free Chromium. This new type of chromium offers a highly significant improvement over ordinary chromium for many bright plating applications. It is free from microscopic cracks inherent in ordinary chromium deposits...giving much greater corrosion protection. Its superior covering and throwing power assure more uniform plate distribution and ample deposits in recesses.

M&T "Duplex Chromium". Most dramatic increase in outdoor durability of chromium brightwork is afforded by this dual-plate development. The thicker the "Duplex Chromium," the longer it lasts—50 millionths of an inch total chromium thickness increases corrosion resistance manyfold in CASS and Corrodkote tests; 100 millionths works wonders. This plate combines an initial deposit of Bright Crack-Free Chromium which is then plated in another special SRHS Bath for chromium with extremely fine crack pattern to avoid localized corrosion at defects in basis metal.

Round and Ribbed Anodes. Cylindrical lead-alloy anodes for chromium plating were originated by M&T and are now available in smooth or ribbed design. They provide higher conductivity and better current distribution, resist warping, cut need for maintenance cleaning and last longer than ordinary flat type anodes.

COPPER & BRONZE PLATING

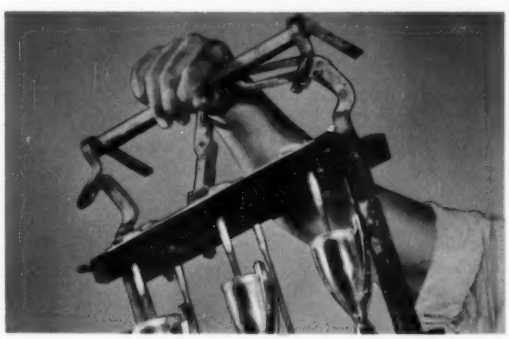
M&T Bright and Semi-Bright Cyanide Coppers. These advanced processes plate mirror bright and semi-bright deposits. They permit use of high current densities for fast plating without burned edges. Stability of addition agents gives greater freedom from decomposition difficulties...assures economy, easy control.

Unichrome Pyrophosphate Copper. Most widely known for smooth and exceptionally dense deposits, this process proves especially useful in engineering-type plating applications, such as on printed circuits, computers, and in electroforming. It also provides an impervious mask or stop-off in nitriding and carburizing applications.

M&T Bronze. This practical and easy-to-control process deposits an alloy plate, approximately 88% copper and 12% tin, with various degrees of brightness. Resembling 24K gold in color, M&T Bronze offers an unusually attractive final finish. It plates fast, with exceptional throwing power.

Neochel.® This recent M&T development improves all cyanide copper and bronze baths. It increases cathode and anode efficiency, cuts cyanide consumption, improves anode corrosion and thereby smooths the deposits, minimizes effect of contaminants. Platers report it outperforms Rochelle salt and other additives.

Copper Anodes. M&T copper anodes are of exceptional purity and are furnished cast or rolled in all popular shapes and sizes to fit the production requirements. OFHC copper anodes offer exceptional anode corrosion and smoothness.



the right choice in...

TIN & ALLOY PLATING

M&T High Speed Tin Plating. This Potassium Stannate process offers metal finishers many benefits whether used for automatic, still tank or barrel tin plating. Because the bath is so stable and operates at high current densities with high cathode efficiency, it cuts both control problems and costs. Production goes up as a result of the higher plating speed. Bath upkeep costs drop because of minimum sludging and consequently less stannate loss. Power requirements are reduced by the high solution conductivity.

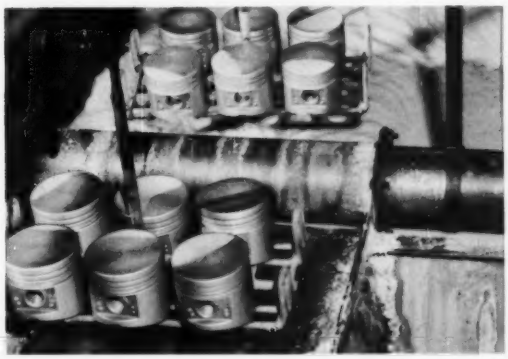
M&T Sodium Stannate Tin Plating. This process, too, gives the advantages of an alkaline bath; easy makeup and control, use of plain steel tanks, wide operating range, excellent throwing power.

Immersion Tinning. M&T Potassium Stannate also proves its profitable versatility in immersion tinning of aluminum, bronze, copper and brass. As the prime ingredient in the bath, it deposits a thin uniform tin coating overall on the work. Now used widely on aluminum pistons, the soft tin means better break-in for automotive engines.

M&T Tin-Zinc. Bath permits plating deposits of various ratios, with 78% tin and 22% zinc generally being the most useful; assures excellent corrosion resistance plus easy solderability and long retention of solderability for electrical products.

M&T Tin-Nickel. This process has outstanding covering power, and deposits an alloy of 65% tin, 35% nickel. Plate is attractive in appearance, highly resistant to corrosion and to tarnishing. It can be deposited directly on most basis metals, by still tank, automatic or barrel plating methods.

Tin Anodes. M&T "High Speed" (pat.) Tin Anodes, used in both potassium and sodium stannate solutions, tend to simplify control, permit use of higher current densities than with ordinary tin anodes, help materially to reduce plating costs.



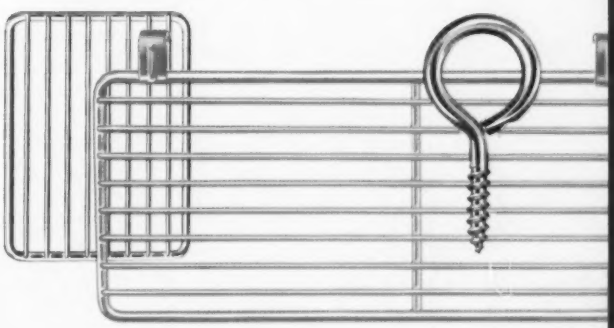
CHROMATE FINISHING

Unichrome Dips. M&T has developed one of the widest lines of compounds for chromate conversion coating of zinc and cadmium. It includes materials for chemically producing chromium-like clears, yellow, brass, olive and black colors, as well as new red, blue, green and gold dyed finishes.

Unichrome Dip Finishes offer good resistance to salt spray and exposure tests, meeting Government and other specifications. They give eye appeal and corrosion protection at low cost.

While all conversion coatings for metals are an integral part of the treated metal surface, they must meet differing needs dictated by the work in process and the production setup. No single chromate solution can satisfy all requirements. The choice available in the M&T line of Unichrome Dips permits proper matching of solution for the product, the degree of corrosion protection and economy desired, the color, and for the manual or automatic processing cycle used. Unichrome "Pick-A-Dip" chart gives data on the compounds.

Anozinc.® This exclusive M&T process converts zinc plate by anodic treatment. It produces black, clear or yellow chromate conversion coatings. Finishes are tougher than those produced chemically, and can be handled while wet. Anozinc cycle uses conventional equipment. The solution offers unusually long life and low cost operation.



With one of the finest and largest laboratories devoted to electrochemical research...with an intimate knowledge of what the industry needs and wants... M&T aims to keep up a constant flow of improvements for better and more economical metal finishing.

M&T MATERIALS THAT CUT OPERATING COSTS

Unichrome Coating 218X. Platers have been saving maintenance money for a decade with this top quality vinyl plastisol rack coating. It has a built-in cure indicator, and can be rebaked for patching. Consistently, it delivers outstanding service life through the severest plating cycles.

Unichrome "Super 5300" Tank Lining. This sprayable vinyl plastisol costs less to apply than sheet lining, gives seamless protection. On tank interiors, it seals solidly against corrosion; on exteriors, it gives a "lifetime" coating. Cut maintenance costs and insure long tank life by specifying this baked-on plastisol.

Unichrome Stop-Off Materials (lacquers, waxes, tape) suit any method of application, any shape of work, any plating cycle.

Unichrome "Resist" Materials include rigid plastics in a variety of shapes for structural use in tanks and composite racks; also flexible tape and tubing for insulation.

Unichrome Strippers will speedily, safely remove electro-deposits from rejects.

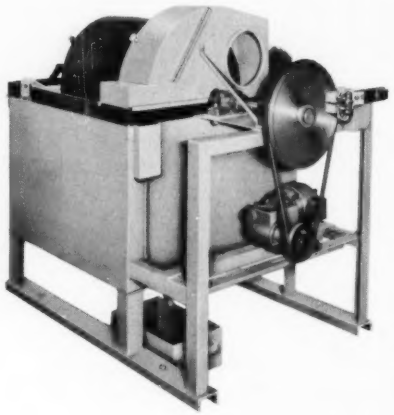
SPECIALIZED EQUIPMENT INTRODUCED BY M&T

Chromium Plating Barrels. M&T developed two notably successful barrels for chromium plating. A *continuous* plating type handles up to 200 pounds of parts per hour. A Unichrome Barrel for *batch* plating is also available. Both types plate high quality chromium that shows no contact marks. They turn plating of small parts into a practical and profitable operation.

The Unichrome SRHS® Chromium Bath used in these barrels provides not only the wide bright plate range that minimizes rejects, but also the speed that increases productive capacity, cuts costs.

Tantalum Equipment. Introduced by M&T for plating use, UNICHROME HEATING AND COOLING COILS of acidproof tantalum have proved their ability to increase efficiency, reduce maintenance, downtime and costs. Especially recommended for chromium plating operations, they will outlast ordinary lead coils many times over.

UNICHROME HEAT EXCHANGERS use tantalum tubes on the acid solution side for same advantages.



Detailed literature and technical information is available. Remember that technical service accompanies all M&T processes and products. It is given willingly. It is plating-minded. It is supported by long experience in the field.

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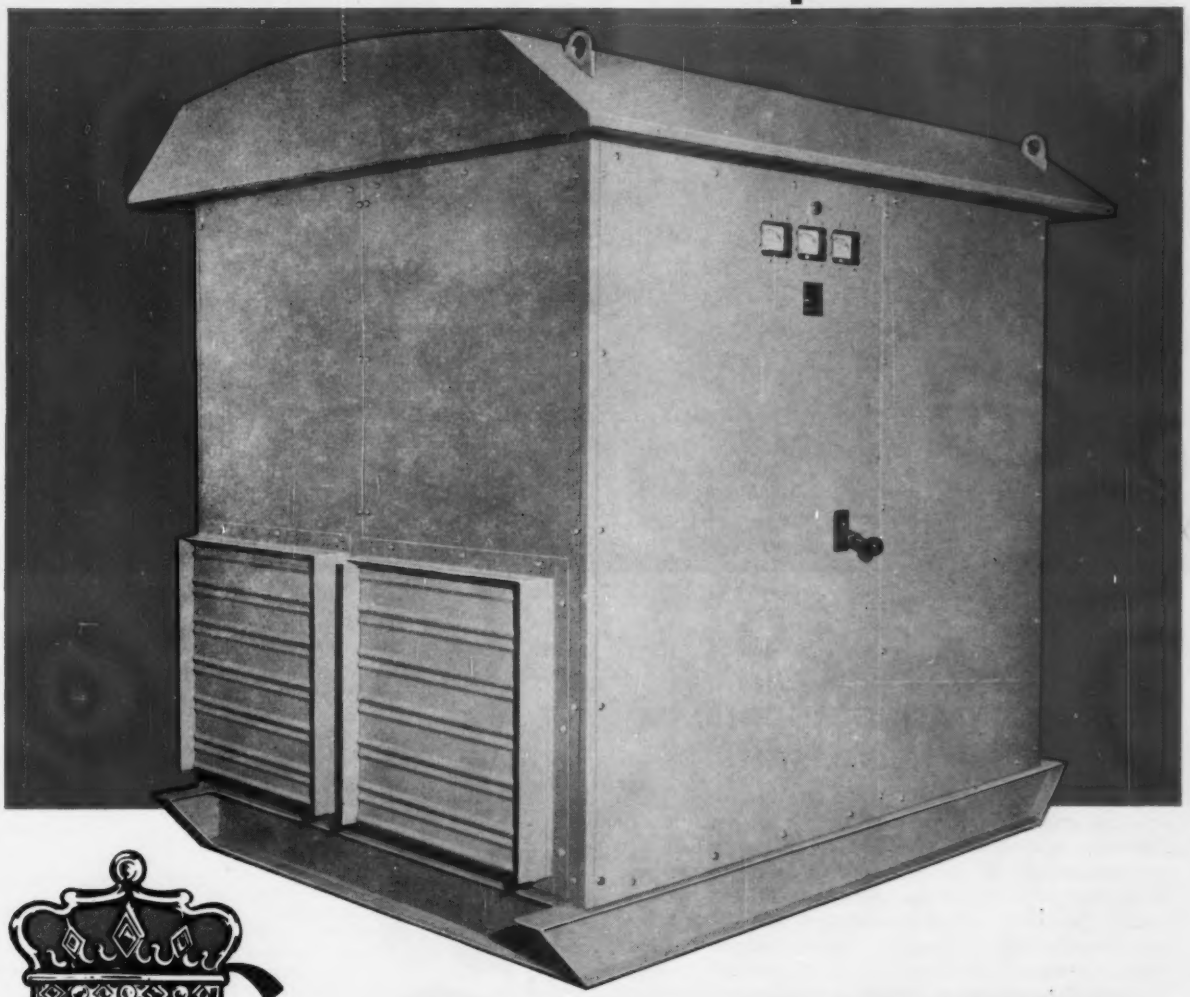

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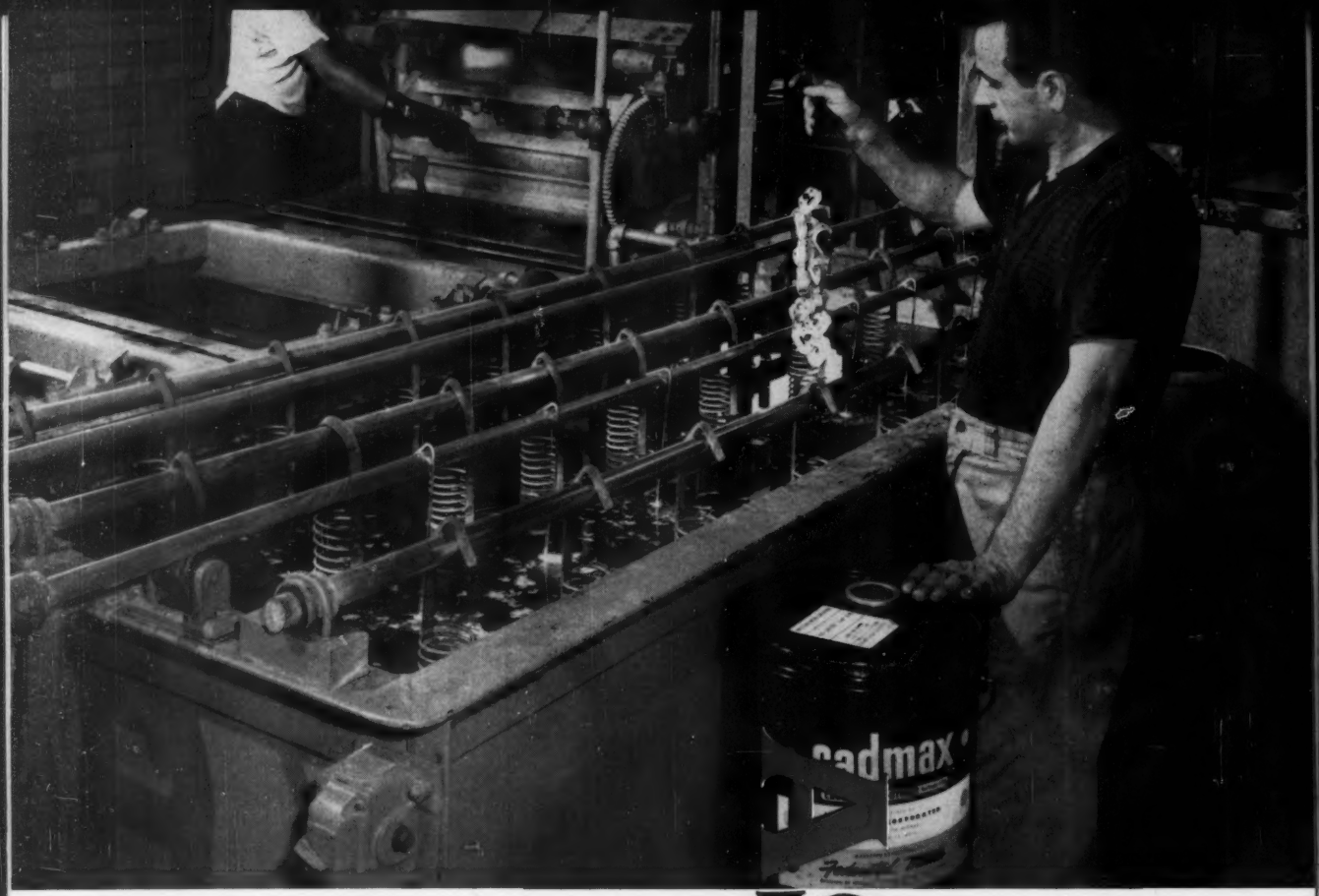

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Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

JULY, 1960 Volume 58 No. 7

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ESTABLISHED 1903 VOLUME 58 • NUMBER 7 • JULY, 1960

CALIFORNIA, HERE WE COME!

In the fifty year history of the *American Electroplaters' Society*, no branch west of St. Louis has ever been host to the Annual Convention. Forty-three years ago, a trip to that metropolis from the East Coast was a project not to be undertaken lightly but, this month, we will be going all the way west to Los Angeles for the metal finishing industry's most important event. When one can cross the continent in less than six hours, distance ceases to be a factor. A dozen years ago, it took the editor almost that much time to drive home from the Atlantic City Convention, only 125 miles away!

The importance of such meetings lies in the opportunities for scientific and intellectual fulfillment, opportunities which are made available only because of the hard work of the Branch Committees, groups which never receive sufficient acknowledgment for their thankless tasks. Thirty-two papers have been scheduled for presentation at the educational sessions, which is a formidable accomplishment in itself, eight of them comprising a Symposium on Hydrogen Embrittlement.

We would hazard the guess that these eight will be best attended and more closely followed, because this is the one subject which probably concerns more platers, and has been responsible for more discouragement, than any other phenomenon in the finishing art. If for no other purpose but to attend this symposium and take part in the related open forum, the trip to Los Angeles would be amply justified. If, to this, we add the information to be gained from the balance of the educational sessions, the range of which can easily be estimated from a glance at the complete program published in this issue of METAL FINISHING, the event becomes even more of a bargain. Add to all this the opportunities always available at such meetings, to learn about new processes and more efficient production methods, to make valuable contacts, and to renew old ones, and missing this Convention may easily turn out to be a most expensive mistake.

To more than mention the diversionary aspects of the trip, such as Hollywood and Disneyland, may turn out to be a source of embarrassment to those fortunate finishers who will be traveling on company expense accounts. We will just remark that the women and children could possibly find themselves bored, but it won't be easy!

Nathaniel Hall

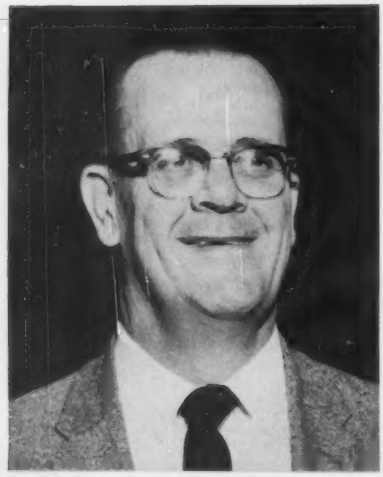
Ralph Wysong
President, A.E.S.

AMERICAN ELECTROPLATERS' TO MEET IN GOLDEN WEST

47th ANNUAL CONVENTION

LOS ANGELES, JULY 24-28

Tony Stabile
General Chairman



George J. Hetz
Co-Chairman

FOR the first time since receiving its charter in 1929, the Los Angeles Branch will host the AES convention — in fact, this will be the first in the "Golden West." Starting July 24th and running through July 28th at the Statler Hotel this, the forty-seventh, promises to be one of the most outstanding conventions ever held by the American Electroplaters' Society, and most old-timers can assure you that there have been some really outstanding educational and social programs presented over the years.

Under the most able leadership of *Tony Stabile,* convention chairman, the committee has gone all out in arranging nine technical sessions at which thirty-two papers will be presented by some of the leading men in the industry. Highlighting the sessions will be an eight-paper symposium on hydrogen embrittlement. Three plant visitations have been arranged, two of which are metal processing firms and the other will be an interesting visit to the Golden Citrus Juices Division of Minute Maid Corp., where tons of oranges, lemons, etc. are processed for juices, concentrates, and extracts, and the residue is converted into food for cattle.

Programs for the ladies and children have been arranged and you can be sure that husbands and fathers will not have to fear that the family is being bored for lack of something to do. The committees have taken full advantage of the many entertaining facilities in this city, which has a population of two and a half million people. Some of the many attractions which have been scheduled are visits to film studios, Disneyland, Knotts Berry Farm, etc. From the program we feel sure that the ladies and children will come away saying that it just didn't last long enough.

This year the Metal Finishing Suppliers' Association will again play a large part in making the convention a success by hosting the registrants at the MFSA ball, to be held Monday evening, and a gigantic cocktail party prior to the annual banquet on Thursday. As usual, the MFSA golf tournament will be held on Tuesday, at the Los Coyotes Country Club. *Herman Struckhoff* has been named the MFSA liaison member to the AES convention committee.

The National Association of Metal Finishers will hold its annual convention at the same hotel starting July 21st, thereby giving its members the opportunity to attend the AES functions without conflict of dates. It also makes it convenient for early arrivers at the AES convention to contact and mingle with the owners and finishing executives of the contract shops.

National Officers

Dr. W. A. Wesley
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Chester G. Borlet
2nd Vice-Pres.

Manuel Ben
3rd Vice-Pres.

Herberth E. Head
Past President

John P. Nichols
Exec. Sec'y.

General Program

All events are at the Statler Hotel, Los Angeles, Calif., unless otherwise noted. Pacific Standard Time applies to all events. Registration fee is $25 per person and $18 per child, with an extra charge of $7 for children who attend the banquet.

Sunday, July 24

9:00 a.m.—*Hq. Room (Dallas Room)*
Executive Board Meeting

9:00 a.m.—*Buffalo Room*
MFSA Trustees Meeting

10:30 a.m.—*Boston Room*
Ladies' Brunch (Sponsored by Los Angeles Branch)

2:00 p.m.—*Washington Room*
Honorary Membership Award Committee Meeting

2:00 p.m.—*St. Louis Room*
Scientific Achievement Award Committee Meeting

3:00 p.m.—*Garden Room*
Ladies' Tea

4:00 p.m.—*Dallas Room*
Credentials Committee Meeting with Executive Board

8:00 p.m.—*Golden State Room*
Get-Together Party

Monday, July 25

8:30 a.m.—*Bus from Statler Hotel*
Children's Bus Outing

10:00 a.m.—*Golden State Room*
Grand Opening Session

11:00 a.m.—*Golden State Room*
Business Meeting, Supreme Society

12:00 noon—*New York Room*
Branch Secretaries' Luncheon

12 noon—*Sierra Room*
MFSA Annual Luncheon

12:00 noon—*Pacific Room*
Ladies' Luncheon

12:15 p.m.—*Cleveland Room*
Speakers' Luncheon

2:00 p.m.—*Golden State Room*
Educational Opening Session

2:00 p.m.—*Bus from Statler Hotel*
Plant Visit, U. S. Chem Milling Corp., Manhattan Beach

2:30 p.m.—*Boston Room*
Editorial Board Meeting

2:30 p.m.—*Dallas Room*
Midwest Regional Council Meeting

2:30 p.m.—*Golden State Room*
Educational Session A

2:30 p.m.—*West Garden Room*
Educational Session B

4:00 p.m.—*Detroit Room*
Order of Past Presidents' Business Meeting

(*Continued on next page*)

Convention Committee

Mrs. Glen J. Beckwith
Ladies

William P. Thomas
Banquet

Earl W. Arnold
Educational

Lawrence O'Neil
Entertainment

Eugene E. Bosl
Children

Walter P. Behlendorf
Finance

Larry M. Henderson
Hotel

Norman F. Painter
Housing

L. Truman Stoner
Outing and Transportation

G. Stuart Krentel
Printing

6:30 p.m.—*Washington Room*
Order of Past Presidents' Dinner

8:00 p.m.—*Pacific and Sierra Rooms*
Convention Ball (Sponsored by Metal Finishing Suppliers' Association — Admittance by Registration Badge)

Tuesday, July 26

8:00 a.m.—*Boston Room*
Charles Henry Proctor Memorial Leadership Award Selection Committee Breakfast

8:00 a.m.—*Cleveland Room*
Speakers' Breakfast

8:30 a.m.—*Los Coyotes Country Club, Buena Park*
Golf Tournament (Sponsored by MFSA)

9:00 a.m.—*Washington Room*
Membership Committee Meeting

9:00 a.m.—*Detroit Room*
Public Relations Committee Meeting

9:00 a.m.—*Dallas Room*
Southwestern Regional Council — Organization Meeting

9:00 a.m.—*Golden State Room*
Educational Session C.

9:00 a.m.—*West Garden Room*
Educational Session D

2:30 p.m.—*Bus from Statler Hotel*
Annual Outing—Disneyland

Wednesday, July 27

8:00 a.m.—*Cleveland Room*
Research Committee Breakfast

8:00 a.m.—*Buffalo Room*
Speakers' Breakfast

8:30 a.m.—*Bus from Statler Hotel*
Children's Supervised Outing

9:00 a.m.—*Golden State Room*
Educational Session E

9:00 a.m.—*Detroit Room*
Research Committee Meeting

9:00 a.m.—*Boston Room*
Publications Committee Meeting

9:00 a.m.—*Washington Room*
Educational Committee Meeting

12:00 noon—*New York Room*
Joint Educational Committee and Branch Librarians' Luncheon

12:00 noon—*Buffalo Room*
Speakers' Luncheon

12:30 p.m.—*Sportsmen's Lodge, North Hollywood*
Ladies' Luncheon and Fashion Show

2:00 p.m.—*Detroit Room*
Research Committee Meeting

2:00 p.m.—*Golden State Room*
Educational Session F

4:00 p.m.—*Dallas Room*
AES Regional Group and Council Chairmen's Meeting

7:30 p.m.—*Los Angeles Room*
Round Table Discussion—"Hydrogen Embrittlement in Metal Finishing"

9:30 p.m.—*Pacific and Sierra Rooms*
Floor Show and Dance

Thursday, July 28

8:00 a.m.—*St. Louis Room*
Speakers' Breakfast

8:30 a.m.—*Bus from Statler Hotel*
Children's Program

9:00 a.m.—*Sierra Room*
Business Meeting, Supreme Society

9:00 a.m.—*Golden State Room*
Educational Session G

9:00 a.m.—*West Garden Room*
Educational Session H

9:30 a.m.—*Bus from Statler Hotel*
Plant Visit, McCulloch Corp., Los Angeles

10:30 a.m.—*Bus from Statler Hotel*
Ladies Tour of Movie Studios

12:30 p.m.—*Farmer's Market*
Ladies' Luncheon and Shopping

1:00 p.m.—*Bus from Statler Hotel*
Plant Visit, Golden Citrus Juices, Inc., Anaheim

2:00 p.m.—*Sierra Room*
Business Meeting, Supreme Society

2:00 p.m.—*Golden State Room*
Educational Session I

6:00 p.m.—*Wilshire Room*
Cocktail Party (Sponsored by MFSA)

7:00 p.m.—*Pacific and Sierra Rooms*
Annual Banquet and Dance

Friday, July 29

8:00 a.m.—*AES Executive Suite*
President's Breakfast for National Officers and Families

9:00 a.m.—*Dallas Room*
Executive Board Meeting

Technical Program

Monday, July 25, 1960

2:00 p.m.—Golden State Room

Second Annual "William Blum Lecture"

Chairman: *Dr. William Blum.*

Faraday's Laws Applied to Cleaning, *Dr. A. Kenneth Graham,* Graham, Savage & Associates, Inc.

Session A

Chairman: *Dr. Harold J. Weisner.*

1. Applying Statistical Quality Control to Plating Processes, *Robert W. Steinmetz,* Western Electric Co., Inc.
2. Chemical Milling: Controlled Metal Removal with Chemicals, *C. Conner Shepherd,* North American Aviation, Inc.
3. Hazards in the Plating Room, *Dr. Walter R. Meyer,* Enthone, Inc., Subsidiary of American Smelting and Refining Co.

2:30 p.m.—West Garden Room

Session B

Chairman: *Herberth E. Head.*

1. Adhesion of Organic Enamels to Electrodeposited Nickel, *Francis X. Carlin,* The International Nickel Co., Inc.
2. Solid Film Lubricants as Organic Finishes, *Lowell C. Horwedel, Electrofilm,* Inc.
3. Magnesium Corrosion, *E. I. Weed,* Convair/Pomona, Convair Div. of General Dynamics Corp.

Tuesday, July 26, 1960

9:00 a.m.—Golden State Room

Session C

Chairman: *Dr. Russell E. Harr.*

1. Recent Developments in Gold Electroplating, *Barnet D. Ostrow* and *Fred I. Nobel,* Lea-Ronal, Inc.
2. A Cyanide Bath for Heavy Gold Plating, *James K. Gore* and *Robert Seegmiller,* University of California, Los Alamos Scientific Laboratory.
3. Acid Gold Plating, *Robert A. Ehrhardt,* Bell Telephone Laboratories, Inc.

9:00 a.m.—West Garden Room

Session D

Chairman: *Dr. Richard B. Saltonstall.*

1. Corrosion and Electrode Potential Studies of Nickel-Chromium Coatings, *Arthur Du Rose,* The Harshaw Chemical Co.
2. A Progress Report on Experiences in Improving the Corrosion Resistance of Automotive Parts, *James D. Thomas, D. W. Hardesty and C. F. Nixon,* General Motors Corp. Research Laboratories.
3. New Data on the Performance of Nickel and Chromium Plated Zinc Die Castings, *W. H. Safranek, H. R. Miller, R. W. Hardy* and *Dr. C. L. Faust,* Battelle Memorial Institute.
4. A Study of Variations in Certain Characteristics of Bright Nickel Deposits with Variations in Bath Temperature, *R. J. Clauss,* The Udylite Research Corp.

Wednesday, July 27, 1960

9:00 a.m.—Golden State Room

Session E

Chairman: *Dr. Harold J. Read.*

1. The Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing, *Dr. Harold J. Read,* Dept. of Metallurgy, The Pennsylvania State University.
2. On the Mechanism of Transport of Hydrogen Across a Solution-Metal Interface, *Dr. Richard J. Barton,* Wright Air Development Div., Wright-Patterson Air Force Base.
3. The Behavior of Hydrogen in Iron and Steel, *Maynard L. Hill,* Westinghouse Electric Corp. Research Laboratories.
4. Detection and Control of Chemisorbed Hydrogen During Electrolysis, *Samuel C. Lawrence, Jr.,* Metal Physics Laboratory, Boeing Airplane Co.

2:00 p.m.—Golden State Room

Session F

Chairman: *Dr. Samuel Heiman.*

1. Measurements Pertaining to Hydrogen Embrittlement, *Dr. Cloyd A. Snavely,* Battelle Memorial Institute.
2. A New Look at the Hydrogen Embrittlement of Cadmium Coated High Strength Steels, *Norman M. Geyer, G. William Lawless* and *Bennie Cohen,* Materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base.
3. Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra High Strength Steel, *Dr. Walter Beck* and *E. J. Jankowsky,* Naval Air Material Center, Aeronautical Materials Laboratory.
4. Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate, *Dr. W. F. Hamilton* and *Myron Levine,* Lockheed Aircraft Corp., California Div.

7:30 p.m.—Los Angeles Room

Round Table Discussion

Chairman: *Dr. Harold J. Read.*
Hydrogen Embrittlement in Metal Finishing.

Thursday, July 28, 1960

9:00 a.m.—Golden State Room

Session G

Chairman: *Dr. Abraham M. Max.*

1. Magnetic Properties of Electrodeposited Cobalt Alloys, *Dr. Victor Zentner,* Hughes Aircraft Co.
2. Plating of Nickel, Cobalt, Iron and Cadmium from Sulfamate Solutions, *Richard C. Barrett,* Barrett Chemical Products Co.
3. The Chemical Reduction of Nickel-Phosphorus Alloys from Pyrophosphate Solutions, *Morton Schwartz,* Kelite Corp.

9:00 a.m.—West Garden Room

Session H

Chairman: *Francis T. Eddy.*

1. Solution Transfer in Barrel Plating, *Paul Glab, R. Scott Modjeska* and *Simon P. Gary,* Scientific Control Laboratories, Inc.
2. Cleaning Techniques in the Electronics Industry, *Dr. D. E. Koontz, Dr. D. O. Feder* and *Dr. C. O. Thomas,* Bell Telephone Laboratories, Inc.
3. Chromium Plating of Rifle Barrels, *Robert J. Girard* and *Edward F. Koetsch, Jr.,* Springfield Armory.

2:00 p.m.—Golden State Room

Session I

Chairman: *Maurice R. Caldwell.*

1. AES Research — Its Purpose and Accomplishments, *J. D. Thomas,* 1959-1960 Chairman, AES Research Committee.
2. Corrosion Protection with Decorative Chromium, *Dr. E. J. Seyb,* Metal & Thermit Corp.
3. Experience in the Operation and Performance of Dual Chromium Systems, *W. E. Lovell, E. H. Shotwell* and *James Boyd,* Ternstedt Div., General Motors Corp.

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Abstracts of Papers

Applying Statistical Quality Control to Plating Processes

By Robert W. Steinmetz,
Western Electric Co., Inc.

Statistical quality control is a scientific method of analyzing data and using the analysis to solve practical problems. How it is applied to the control of plating baths and plating thickness to reduce costs and increase quality are illustrated. Cost reduction and quality improvement can be illustrated best by utilizing the control chart which has the ability to form data into patterns which, when tested statistically, can lead to information about the process.

Chemical Milling: Controlled Metal Removal with Chemicals

By C. Conner Shepherd,
North American Aviation, Inc.

The factors which have led to the development of chemical techniques for metal removal are discussed in relation to present applications of the chemical milling process. The factors to be considered in selection of a chemical etchant are described, along with variables influencing efficiency of the major processing steps.

Hazards in the Plating Room

By Dr. Walter R. Meyer,
Enthone, Inc., Subsidiary of American Smelting and Refining Co.

Causes for serious accidents, explosions and fires that have occurred in the plating room are described. Hydrogen explosions and eruptions from heated caustic solutions are considered. The hazards associated with the use of the following chemicals are discussed: cyanides, chlorinated solvents, sulphuric acid, halogen-oxygen compounds, chromates, nitric acid, hydrogen peroxide, and hydrofluoric acid. Miscellaneous accidents of different natures are mentioned.

Dr. William Blum

Adhesion of Organic Enamels to Electrodeposited Nickel

By Francis X. Carlin,
The International Nickel Co., Inc., Research Labortory

Strong bonds between freshly deposited nickel and subsequent organic enamel finishes have been effected. Various aqueous solutions of organic and inorganic compounds are employed as post-treatments for the electrodeposits. The solutions apparently react either to cause a conversion-type film on the nickel surface or to deposit a thin film of material which becomes strongly bonded to nickel. The film produced is receptive to application of a coating of organic enamel. Types of solutions, methods of application of nickel, films, and organic finishes, and the method for testing the bond are discussed.

Solid Film Lubricants as Organic Finishes

By Lowell C. Horwedel,
Electrofilm, Inc.

The place in which solid film lubricants fit into the organic finishing industry is presented. The diversified field of their application as organic finishes, due to such physical properties as color, electrical conductivity, corrosion resistance and others is discussed. Emphasis is placed on corrosion resistance and substantiating data are presented graphically and with photographs. The effect of pre-treatments on the corrosion resistance of basis metals "coated" with solid lubricants and the relative corrosion resistance of the basis metals so treated are developed at considerable length.

Magnesium Corrosion

By E. I. Weed,
Convair/Pomona, Convair Div. of General Dynamics Corp.

Considerable progress has been made in the past ten years in the field of materials and processes for the corrosion protection of magnesium. These improvements include anodizing processes, plating processes and

Dr. Harold J. Wiesner

Herberth E. Head

various organic coating materials. In spite of these improvements, the protection of magnesium when subjected to a corrosive environment continues to be a problem. This problem can be solved in most cases by intelligent use of protective mechanisms now available, attacking on three levels — engineering, production and quality control.

Recent Developments in Gold Electroplating

By Barnet D. Ostrow and Fred I. Nobel,
Lea-Ronal, Inc.

A discussion of the new developments in gold plating with particular emphasis on application of such processes to industrial usage. The low pH type acid gold baths are discussed as well as a new high speed bright cyanide gold. Graphs, photomicrographs and tables of physical characteristics are presented.

A Cyanide Bath for Heavy Gold Plating

By James K. Gore and Robert Seegmiller,
University of California, Los Alamos Scientific Laboratory

A cyanide gold plating bath capable of producing heavy gold deposits with good physical properties at rapid plating rates and reasonable temperatures is described. Designed for use in engineering applications, the bath produces bright to semi-bright, smooth, fine-grained, hard and relatively pore-free deposits, as rapidly as 1.5 mils/hr. Although the deposits are hard, they are more ductile than most commercial bright golds. Smooth deposits 20-30 mils thick are readily obtained.

Acid Gold Plating

By Robert A. Ehrhardt,
Bell Telephone Laboratories, Inc.

An acid gold plating bath developed for plating on printed circuits is described. It includes the study of the influence of pH, temperature, current density and bath composition on cathode efficiency and appearance. A porosity test was developed and used to determine the influence of the physical condition of the basis metal and of the various operating parameters on the porosity of thin gold deposits.

Dr. Richard B. Saltonstall

Corrosion and Electrode Potential Studies of Nickel-Chromium Coatings

By Arthur H. Du Rose,
The Harshaw Chemical Co.

A corrosion protection comparison for different systems of nickel-chrome deposits is given. It is shown that "duplex" nickel has much to offer in improved protection for plated parts. The correlation among various types of exposure tests is discussed. The outdoor corrosion weight loss for bright nickel foil is only slightly greater than that for sulfur-free nickel, but the degree of perforation is much greater, and chromium intensifies the perforation. Potential, galvanic, and polarization data are given for bright nickel, sulfur-free nickel and chromium.

A Progress Report on Experiences in Improving the Corrosion Resistance of Automotive Parts

By James D. Thomas, D. W. Hardesty and C. F. Nixon,
General Motors Corp. Research Laboratories

With improvement in the corrosion resistance of decorative plated finishing systems, the CASS test has been modified, especially as to the time required for testing, because in its present form as much as 100 hours has been required to produce failure. Further experience now permits better correlation of CASS results with outdoor performance, particularly for plating capable of withstanding 16 hours or more of CASS exposure without failure. Changes in plating techniques which have resulted in improved corrosion resistance are discussed.

New Data on the Performance of Nickel and Chromium Plated Zinc Die Castings

By W. H. Safranek, H. R. Miller, R. W. Hardy, and Dr. C. L. Faust,
Battelle Memorial Institute

The results of research conducted on procedures for improving electroplated zinc die castings have shown outstandingly better corrosion performance for die castings plated with 0.8 or 1.2 mils of duplex nickel and 0.05 mil of bright crack-free chromium in place of bright nickel-ordinary chromium composites. Greater resistance to cracking during thermal cycling was another advantage shown for duplex nickel. Higher impact values were obtained for die-cast zinc alloy when bright nickel was replaced by duplex nickel. Crack-free chromium eliminated the corrosion pitting that occurred in duplex nickel-ordinary chromium composites. In this respect, outdoor weathering confirmed the results of accelerated corrosion studies.

A Study of Variations in Certain Characteristics of Bright Nickel Deposits with Variations in Bath Temperature

By R. J. Clauss,
The Udylite Research Corp.

The effects of operating bright nickel solutions at temperatures above 175F have been studied and certain characteristics of the electrodeposit such as microstructure, appearance, and ductility are compared with the properties of deposits made at normal plating temperatures. The effectiveness of various addition agents at these temperatures is compared to their utility at today's lower operating temperatures. Analogous properties of bright nickel deposited at elevated temperatures and bright nickel-cobalt alloy deposits are also discussed.

The Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing

By Dr. Harold J. Read,
Department of Metallurgy,
The Pennsylvania State University

The practical problems of metal damage by hydrogen are outlined with emphasis on metal finishing aspects. The nature and extent of damage are discussed. Remedies are classified according to their application, that is, as modifications of the finishing processes to prevent hydrogen occlusion or as post treatments to remove occluded hydrogen. Selection of metals and finishes for specific applications is discussed in the light of hydrogen damage problems, and metallurgical information of assistance to metal finishers who must face embrittlement problems is presented.

On the Mechanism of Transport of Hydrogen Across a Solution-Metal Interface

By Dr. Richard J. Barton,
Wright Air Development Div.,
Wright-Patterson Air Force Base

The mechanisms of hydrogen entry into and release from metals are discussed in consideration of presently accepted mechanisms for the hydrogen electrode reaction. The applicability of these hydrogen evolution mechanisms to certain solutions and metals is considered. These mechanisms are analyzed, using various possible migrating species, to determine at which stage deviation from the gas evolution process may occur to cause hydrogen entry into the metal. The effects of the rates of various kinetic steps, the nature of the surface films, and the amount of the surface coverage are evaluated and experimental evidence is cited. The influence that mechanisms of the release process may have upon penetration studies is pointed out.

The Behavior of Hydrogen in Iron and Steel

By Maynard L. Hill,
Westinghouse Electric Corp., Research Laboratories

Studies of the solubility and diffusivity of hydrogen in ferritic alloys have shown that the normal behavior above about 200C is for the hydrogen to dissolve interstitially. However, several pronounced deviations from this fundamental behavior have been observed at lower temperatures where embrittlement occurs. These indicate that the hydrogen no longer resides in interstitial sites but, instead, segregates at sites of lower energy. Various possible types of segregation, such as condensation around dislocations, molecular gas formation in voids, chemisorption in cracks, and others are discussed along with the possible role of such segregations in the mechanism of embrittlement.

Detection and Control of Chemisorbed Hydrogen During Electrolysis

By Samuel C. Lawrence, Jr.,
Metal Physics Laboratory,
Boeing Airplane Co.

Instrumentation to detect and measure hydrogen entering plated parts during electrolysis is described, and data obtained from experiments employing these techniques have been applied successfully to keep chemisorbed hydrogen to a minimum. The relative importance of different "catalysts" or "poisons" on adsorption rates is shown, and proper control of voltage, temperature, and other parameters allows satisfactory plating

Dr. Russel E. Harr

Dr. Harold J. Read

Dr. Samuel Heiman

Dr. Abraham M. Max

to be made with low hydrogen pickup. Adsorption during other portions of the electroplating process, such as liquid honing, cleaning, pickling, and rinsing can also be reduced substantially. These methods can be used for continuous, accurate monitoring of chemisorbed hydrogen.

A New Look at the Hydrogen Embrittlement of Cadmium Coated High Strength Steels

By Norman M. Geyer, G. William Lawless, and Bennie Cohen,
Materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base

A sensitive embrittlement test consists of a sustained loaded notched tensile specimen, loaded at 75 per cent of the ultimate notched tensile strength for a minimum of 200 hours. Detrimental hydrogen embrittlement is shown to be dependent upon the steel alloy, the current efficiency of the cadmium plating bath and the physical structure of cadmium coating obtained. Cadmium electroplating processes for coating high strength steel without detrimental hydrogen embrittlement are given.

Measurements Pertaining to Hydrogen Embrittlement

By Dr. Cloyd A. Snavely,
Battelle Memorial Institute

Measuring techniques which have been useful in hydrogen embrittlement studies are described, and their usefulness for future studies is critically examined. Included in the discussion are hydrogen charging methods, stressing methods, analytical problems, surface effects, and related phenomena. Problems in developing a standard embrittlement test are outlined.

Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra High Strength Steel

By Dr. Walter Beck and E. J. Jankowsky,
Naval Air Material Center, Aeronautical Materials Laboratory

Effective reduction of hydrogen embrittlement of ultra high strength steel resulting after chromium and cyanide cadmium electroplating was achieved by pyrophosphate copper and Watts type nickel undercoats and replacement of the cyanide cadmium plating solution by the fluoborate bath. Embrittlement was evaluated by measurements of bend and tensile ductilities and sustained-loading delayed-failure tests on notched specimens. The sustained-loading test exceeds the other two procedures in sensitivity and reliability. Mechanisms were suggested for embrittlement inhibition by metallic undercoats and replacement of the cyanide by the fluoborate solution and the experimental results discussed in the light of these mechanisms.

Francis T. Eddy

Maurice R. Caldwell

Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate

By Dr. W. F. Hamilton and Myron Levine,
Lockheed Aircraft Corp., California Div.

A modification of the conventional electroplating process has been developed by which the plating of high strength steel parts can be satisfactorily accomplished without harmful hydrogen embrittlement. Addition of sodium nitrate and a throwing power additive to a high cadmium, low free-cyanide electrolyte produces satisfactory operating characteristics without visible cathodic gassing. The need for post plate baking is eliminated. A new cleaning procedure has been developed for use with the modified electrolyte and the operation, control, testing and results of the process are given.

Magnetic Properties of Electrodeposited Cobalt Alloys

By Dr. Victor Zentner,
Hughes Aircraft Co.

The performance of permanent magnets depends primarily on the magnitude of the coercive force and remanence of the magnetic material. The correlation of these two properties with plating conditions in electrodeposited cobalt-nickel and other binary cobalt alloys were investigated. Photographs of hysteresis curves taken with the aid of a B/H loop tracer which displays these curves visually on an oscilloscope show the influence of conditions of deposition on these magnetic properties. Corroborative evidence for the magnetic behavior of these alloys is shown by saturation curves obtained by plotting writing currents for signals at various frequencies against readback voltage. Preferred conditions of deposition for producing alloys with desirable magnetic properties have been established.

Plating of Nickel, Cobalt, Iron and Cadmium from Sulfamate Solutions

By Richard C. Barrett,
Barrett Chemical Products Co.

Technical data are given on the application and properties of nickel electrodeposited from sulfamate solution, with particular emphasis on high temperature applications of deposits, special magnetic properties of nickel-cobalt and nickel-iron alloys. Hydrogen embrittlement aspects of cadmium deposition at 100 per cent cathode efficiency in sulfamate plating baths are discussed. Bath formulas and operating conditions covering the electrodeposition of cobalt, iron, and cadmium from sulfamate solutions are included.

The Chemical Reduction of Nickel-Phosphorus Alloys from Pyrophosphate Solutions

By Morton Schwartz,
Kelite Corp.

New electroless nickel solutions using pyrophosphate complexing agents have been developed. These alkaline pyrophosphate solutions can be operated at temperatures lower than normally employed, with higher deposition rates. The solutions are stable and easily maintained and controlled. Deposition rates of 0.5 to 0.7 mil/hr have been obtained at 68 to 74C. The composition of the deposit is constant at 5 per cent phosphorus over a wide range of operating conditions. The effects of the important variables are discussed.

Solution Transfer in Barrel Plating

By Paul Glab, R. Scott Modjeska and Simon P. Gary,
Scientific Control Laboratories, Inc.

Results are presented of a study of solution changes within a plating barrel occurring during the plating period and the effects of those changes in deposit characteristics, plating rates, etc. A barrel is immersed in clear water with a soluble dye added to the barrel. Color dilution measurements show quantitive rate of solution transfer. Types of loads, perforation sizes and barrel speeds are varied. Studies in actual production in cadmium, copper, nickel, silver, tin, zinc, and brass show metal ion concentration variation within the barrel from start to cycle completion.

Cleaning Techniques in the Electronics Industry

By Dr. D. E. Koontz, Dr. D. O. Feder and Dr. C. O. Thomas,
Bell Telephone Laboratories, Inc.

Trace amounts of extraneous materials may significantly influence either the electrical characteristics or the feasibility of fabrication of modern electronic devices. Current trends in the electronics industry which have created a need for more effective control over both the type and amount of residual contaminants are described. Contaminants are classified and examples are presented of their effects on the performance of typical devices. Practical techniques developed for the detection, removal and control of contaminants are described. Cleaning techniques and their integration into typical cleaning cycles of interest to electroplaters are presented.

Chromium Plating of Rifle Barrels

By Robert J. Girard and Edward F. Koetsch, Jr.,
Springfield Armory

The process for chromium plating the M14 barrel has advanced to a production stage at Springfield Armory. This paper discusses the methods employed in the development and adaptation of a process to electropolish and chromium plate the entire bore and chamber of the M14 Springfield Rifle. Electropolishing and chromium plating processes are outlined, including processing equipment and procedures, bath compositions, fixture design and maintenance, semi-automatic bore-cleaning operations, gaging of barrels, time guides for controlling electropolishing and chromium plating, and the relationship of viscosity and temperature to the degree of taper obtained during electropolishing.

Santa Monica Beaches.

AES Research — Its Purpose and Accomplishments

By J. D. Thomas,
1959-1960 Chairman,
AES Research Committee

The reasons for sponsoring research, the aims in selection of areas to be studied, and benefits to be gained are discussed. Financial support is obtained from Active Members, Sustaining Memberships, and donations from Branches and other Societies. A brief review is given of the presently active projects and those which have been completed. What the future promises is contemplated in view of the rapid changes taking place in the metal finishing industry.

Corrosion Protection with Decorative Chromium

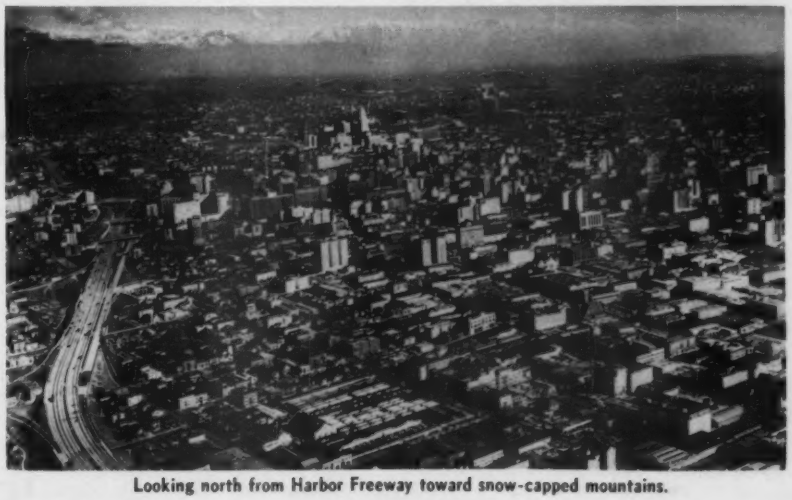
By Dr. E. J. Seyb,
Metal & Thermit Corp.

During recent years there have been dramatic advances in the concept of chromium's role in corrosion protection with copper-nickel undercoats. Previously, chromium was not considered in providing corrosion protection, and was used primarily for tarnish resistance. It is now recognized that chromium is a major factor in providing improved corrosion protection. The improvement is obtained by means of greater thicknesses of crack-free or duplex chromium. These different chromium deposits are discussed, and their corrosion protection illustrated by accelerated and outdoor exposure tests. Industrial applications are described.

Experience in the Operation and Performance of Dual Chromium Systems

By W. E. Lovell, E. H. Shotwell and James Boyd,
Ternstedt Div., General Motors Corp.

Dual chromium plating has been practiced on a production scale for about two years, and is shown on the basis of accelerated and outdoor exposure tests to provide markedly improved corrosion resistance over the single chromium system formerly used. Methods of applying dual chromium, and problems encountered, are discussed. Theory explaining the improvement in corrosion resistance obtained by dual chromium is developed, including illustrations of desired crack patterns, potentials of electrodeposited metals and techniques used for their measurement, and the mechanisms of corrosion in single and dual chromium systems.



Looking north from Harbor Freeway toward snow-capped mountains.

Ladies' and Children's Programs

Disneyland main street, one of the many fabulous attractions in Walt Disney's magic kingdom, thrilling to young and old alike.

Since the convention is being held in Los Angeles during the vacation season this year, the ladies' and children's program takes on added interest and importance. The committee has arranged a schedule of events that includes such attractions as Hollywood and Disneyland. "Dolly" Beckwith is chairman of the ladies' program and E. C. Bos is chairman of the children's committee. For very young children, licensed baby-sitters will be available. The program follows:

Disneyland, California, is a wonderful place for the family camera, where children can be photographed in surroundings that bring their own fantasies to life.

Sunday, July 24

10:30 a.m.—*Boston Room, Statler Hotel*
Ladies — Brunch Honoring National Officers' Wives (Sponsored by Los Angeles Branch)

3:00 p.m.—*Garden Room, Statler Hotel*
Ladies—California Welcome Tea

8:00 p.m.—*Golden State Room, Statler Hotel*
Ladies and Children — Get-Together Party

Monday, July 25

8:30 a.m.—*Leave from Statler Hotel*
Children—Supervised Bus Outing. Itinerary includes Forest Lawn Park, Universal-International Movie Studio, Farmer's Market (includes lunch), "Homes of the Stars" in Hollywood and Beverly Hills, Santa Monica Beach

12:00 noon—*Pacific Room, Statler Hotel*
Ladies—Luncheon and Entertainment

8:00 p.m.—*Pacific and Sierra Rooms, Statler Hotel*
Ladies and Children—Convention Ball (Sponsored by MFSA—Admittance by Registration Badge)

Tuesday, July 26

2:30 p.m.—*Leave from Statler Hotel*
Ladies and Children—Annual Outing—Disneyland

Wednesday, July 27

8:30 a.m.—*Leave from Statler Hotel*
Children—Supervised visit to Marine Land of the Pacific and Knott's Berry Farm (lunch)

12:30 p.m.—*Sportsmen's Lodge, North Hollywood*
Ladies—Luncheon and Don Loper Fashion Show. Buses leave Statler Hotel at 11:00 a.m.

9:30 p.m.—*Pacific and Sierra Rooms, Statler Hotel*
Ladies and Children—Floor Show and Dance

Thursday, July 28

8:30 a.m.—*Leave from Statler Hotel*
Children—Supervised visit to Corriganville (Tentative)

10:30 a.m.—*Leave from Statler Hotel*
Ladies—Tour of the Movie Studios

12:30 p.m.—*Farmer's Market*
Ladies — Dutch Treat Luncheon and Shopping

6:00 p.m.—*Wilshire Room, Statler Hotel*
Ladies—Cocktail Party (Sponsored by MFSA)

7:00 p.m.—*Pacific and Sierra Rooms, Statler Hotel*
Ladies and Children—Annual Banquet and Dance

Friday, July 29

8:00 a.m.—*AES Executive Suite, Statler Hotel*
Ladies and Children—President's Breakfast for National Officers and Families

Metal Finishing Suppliers' Association

R. F. Ledford
President

F. P. Green
1st Vice-Pres.

J. G. Carrique
2nd Vice-Pres.

H. L. Kellner
3rd Vice-Pres.

E. W. Couch
Past President

A. P. Munning
Exec. Secretary

E. A. Blount
Treasurer

M. Glover
Acting Secretary

THE MFSA, as usual, has planned a busy schedule during the Los Angeles convention both business-wise and entertaining the conventioneers. The Board of Trustees, headed by *President Ray Ledford* (which, incidentally, has had a busy season since the Detroit convention by holding meetings in Newark, N. J., Chicago, Ill. and a joint meeting with the national officers of the AES in Philadelphia, Pa.), will get right down to business by meeting at 9:00 a.m. in the Buffalo Room on Sunday, July 24th. At this meeting ballots for election of trustees will be counted, chairmen of various committees will make reports on projects undertaken during the year, and other matters of importance to the association will be discussed.

It is with regret that we report our hardworking and most capable secretary, *Gus Munning*, will not attend this convention due to an operation from which he is now recuperating; however, we are fortunate in having a good pinch-hitter in *Manson Glover*. Also on the sick list is *Dave Clarin*, a former president of the MFSA.

The MFSA annual luncheon and business meeting will convene in the Sierra Room Monday at 12 noon and adjourn promptly at 2:30 p.m. This affair is open to representatives of suppliers in the industry and has always been very interesting to those in attendance, as new officers are installed and many items of interest are discussed from the floor.

The social events sponsored by the MFSA during the convention will lead off with the Open House Ball to be held Monday evening at 8:00 p.m. in the Pacific Ballroom and the Sierra Room, during which there will be continuous dancing and light beverages will be served. Ladies' wrist watches will be given as prizes to lucky holders of registration numbers drawn at the Ball. Registration badges will be "tickets of admission" and for late comers there will be registration facilities on the ballroom floor.

Bob Burford, golf chairman, has arranged for the annual golf tournament to be held on Tuesday at the Los Coyotes Country Club, Buena Park. Greens fees will be paid at the club, where lunch, dinner and bar refreshments may be had on a cash basis. Tee-off time is 8:30 a.m. to 1:00 p.m. Those wishing to attend will register at the convention desk where directional maps will be available.

An added feature this year will be a cocktail party to be held Thursday evening in the Wilshire Room from 5:50 to 6:50 p.m., closing promptly at the latter hour to permit all to be on hand for the opening of the annual banquet. Admission to this cocktail party will be by registration badge only.

A word of thanks is due to *Herman Struckhoff*, who has done a fine job in acting as liaison representative between the MFSA and the Los Angeles convention committee.

E. L. Combs
Trustee

L. A. Davies
Trustee

A. B. Hoefer
Trustee

H. J. McCracken
Trustee

R. M. Norton
Trustee

J. E. Trumbour
Trustee

H. J. Struckhoff
Liaison

R. M. Burford
Golf Chairman

NAMF To Meet In Los Angeles

The National Association of Metal Finishers will hold its annual convention prior to the American Electroplaters' Society convention. The NAMF will also use the Statler Hotel as headquarters for its meetings, which start on Thursday, July 21st.

Program

Thursday, July 21, 1960

9:00 a.m.-5:00 p.m.—*Sierra Room*
Board of Directors

6:00 p.m.-10:00 p.m.—*Studio Bar*
"Let's Get Acquainted"

Friday, July 22, 1960

9:00 a.m.-5:00 p.m.—*Ballroom-Lounge Area*
Registration

9:30 a.m.—*Bus from Statler*
Wives and children to Marineland

9:30 a.m.-12 noon—*Sierra Room*
Annual Membership Meeting and Election of Directors

1:30 p.m.-5:00 p.m.—*Washington Room*
Board of Directors Meeting and Election of Officers

Saturday, July 23, 1960

9:30 a.m.-12 noon—*Mezzanine*
Registration

9:30 a.m.—*Bus from Statler*
Tour of world-famous Farmers' Market. Lunch and fashion show at Beverly Hilton Hotel, Hollywood

9:30 a.m.-10:45 a.m.—*Los Angeles Room*
1st Management Seminar: Speaker—Dr. Theodore A. Andersen, UCLA, "Management Planning for Profits"

10:45 a.m.-12 noon—*Los Angeles Room*
2nd Management Seminar: Speaker—Dr. Orlo M. Brees, National Assn. of Manufacturers, "Is it a Sin to Make a Profit?"

1:30 p.m.-5:00 p.m.—*Los Angeles Room*
3rd Management Seminar — Panel Discussion: Moderator — Bert J. Sherwood, Chemplate Corp., Los Angeles, "Operating Cost Factors." Panelists and Topics: Walter P. Behlendorf, Spence Electro-Plating Co., Los Angeles, "Welfare and Fringe Benefit Labor Costs;" E. Paul Koecritz, Jr., L.A. Parkerizing Co., Los Angeles, "Job Costing in Plating and Enameling;" Bert J. Sherwood, Chemplate Corp., Los Angeles, "A Unique Job Costing System;" David P. Hicks, Western Metal Finishing Co., Los Angeles, "Cost Factors in Barrel Plating;" Jerry Burton, Burton Silverplating Co., Culver City, Calif., "Cost Factors in Precious Metal Plating;" Harold E. Coombes, Jr., Crown City Plating Co., El Monte, Calif., "Cost Estimating Procedures."

6:30 p.m.-8:30 p.m.—*Sierra Room*
Registration (Final)

7:00 p.m.-8:00 p.m.—*Sierra Room*
Reception and Cocktail Party

800 p.m.-9:30 p.m.—*Sierra Room*
Banquet

9:30 p.m.-2:00 a.m.—*Terrace Room*
Dancing, Floor Show and Entertainment

Sunday, July 24, 1960

6:00 p.m.-8:00 p.m.—*Cleveland Room*
Dinner-Meeting (Industry-wide steering committee on public relations)

Monday, July 25, 1960

8:30 a.m.-10:30 a.m.—*Washington Room*
Breakfast-Meeting (Local Association Secretaries)

9:30 a.m.—*Bus from Statler*
Tour of City of Hollywood and a movie studio

10:30 a.m.-5:00 p.m.—*Bus from Statler*
Plant Tour (NAMF registration badge required. Tour restricted to persons outside of So. Calif. area). Itinerary: Crown City Plating, Los Angeles; Burton Silverplating, Culver City.

Post Convention Program

Tuesday, July 26, 1960

2:30 p.m.—*Bus from Statler*
Trip to Disneyland

A. T. Leonard
NAMF President

Harold E. Coombes, Sr.
NAMF Convention Chairman

Harold E. Coombes, Jr.
Co-Chairman

PACIFIC COAST DIRECTORY

California, Oregon, Washington and Arizona

The following columns list the sales outlets in the states of California, Oregon, Washington, and Arizona of manufacturers and distributors of finishing equipment and supplies. Included in this directory are national firms having sales outlets in these states as well as their distributors and jobbers and all regional manufacturers of equipment and supplies for finishing metal and plastic products. Where a firm is national or located outside this area, it is shown with home office address in regular type followed by the West Coast information in italics.

Since many national firms use the same jobbers and/or distributors in this four state region, in order to avoid unnecessary duplication, the addresses and telephone numbers of the jobbers or distributors appear only once in their alphabetical position. All addresses in *italics* are located in California unless other states are shown.

S. L. Abbot Co.
4255 District Boulevard, Los Angeles 58
LUdlow 9-6211
135 King Street, San Francisco
SUtter 1-8802

Absco Welding Supplies
2202 S. Garfield, Los Angeles
OVerbrook 5-8800

Acme Mfg. Co.
1400 E. Nine Mile Road, Detroit 20, Mich.
L. H. Butcher Co.

Acoustica Associates, Inc.
Fairchild Court, Plainview, L. I., N. Y.
10400 Aviation Blvd., Los Angeles
SPring 6-0511

Alchemize Corp.
625 S. Kolmar Avenue, Chicago 24, Ill.
Laco Enginering & Sales Inc.

Alert Supply Co.
2041 S. Davie Avenue, Los Angeles 22
RAymond 3-8641
923 Harrison St., San Francisco
SUtter 1-4563

Allied Chemical Corp., Solvay Process Div.
61 Broadway, New York 6, N. Y.
235 Montgomery St., San Francisco 4
YUkon 2-6840

Allied Research Products, Inc.
4004-06 E. Monument St., Baltimore 5, Maryland
L. H. Butcher Company

Allspray Co.
4990 W. Pico Blvd., Los Angeles
WEbster 3-9563

Almco-Queen Products, Div. King-Seeley Corp.
910 E. Main St., Albert Lea, Minnesota
1326 Knox Street, San Fernando
EMpire 1-8966
Montague-Harris & Company
Star Machinery Company

Alsop Engineering Corp.
428 Bright Street, Milldale, Connecticut
844 E. 12th St., Oakland 6
TEmplebar 2-0103
J. W. Leser Company

Amercoat Corp.
4809 Firestone Blvd., South Gate
LOrain 4-2581

American Brass Co.
414 Meadow Street, Waterbury 20, Conn.
120 Montgomery St., San Francisco
YUkon 6-0051

American Buff Co.
2414 S. LaSalle St., Chicago, Ill.
6507 Compton Ave., Los Angeles
LUdlow 1-0843

American Metal Climax, Inc.
1270 Ave. of the Americas, New York 20, N. Y.
650 S. Grand Ave., Los Angeles 17
MAdison 7-1028

Anchor Chemical & Supply Co.
22602 Burbank Blvd., Woodlands Hills
DIamond 7-6114

Arizona Abrasive & Supply Co.
2118 E. Washington, Phoenix, Ariz.
ALpine 4-4759

John L. Armitage & Co.
245 Thomas St., Newark 5, N. J.
4370 Haag Road, Martinez
ACademy 8-2856

Atlas Chemical & Manufacturing Co.
P. O. Box 2322, San Diego
BElmont 2-7391

The Atlas Mineral Products Co.
Mertztown, Pennsylvania
Hollingsworth Building, 606 South Hill St., Los Angeles 14
MAdison 2-1444
Stiehl & Company
Unit Process Company

Atlas Powder Co.
Fairfax, Wilmington 99, Delaware
Room 805, Title Guarantee Bldg., 411 W. 5th St., Los Angeles
MAdison 4-8896
2036 Pioneer Court, San Mateo
FIreside 1-5894
L. H. Butcher Company
McKesson & Robbins, Inc., Mefford Chemical Branch

Aviation Lubricants Co., Inc.
2361 India St., San Diego 12
BElmont 9-5155

B-H-S Machinery Co.
717 Airport Blvd., S. San Francisco
PLaza 5-4466

B & T Equipment Co.
45 Elmira St., San Francisco

Bacon Felt Co.
11 Fifth Street, Taunton, Massachusetts
George B. Tewes Co.

Alan Baker Co.
180 Sylvester Rd., S. San Francisco
PLaza 5-6506

Baron Industries
241 W. Avenue 26, Los Angeles 31
CApital 2-0225

Barrett Chemical Products Co., Inc.
5 Bridge Street, Chelton, Conn.
L. H. Butcher Co.

Beck Equipment Co.
3350 W. 137th Street, Cleveland 11, Ohio
1165 Rosefield Way, Menlo Park

Beckman Instruments, Inc.
325 N. Muller Ave., Anaheim
PRospect 4-5430

Bee Chemical Co., Logo Div.
12933 S. Stony Island Ave., Chicago 33, Ill.
Decorative Engineering & Supply, Inc.

Behr-Manning Co.
4656 Howe Street, Troy, New York
4950 E. 49th St., Los Angeles 58
LUdlow 9-5331
1001 16th St., San Francisco 7
UNderhill 3-7730
540 W. Idaho St., Seattle 4, Wash.
MAin 4-3030

Belke Manufacturing Co.
947 N. Cicero, Chicago 51, Illinois
Great Western Chemical Company

Bendix Aviation Corp., Pioneer Central Div.
Davenport, Iowa
117 E. Providencia Ave., Burbank
THornwall 5-1571

Berkshire Chemicals, Inc.
1625 W. El Segundo Blvd., Compton
NEvada 6-8212

Better Finishes & Coatings, Inc.
268 Doremus Ave., Newark 5, N. J.
2014 E. 15th St., Los Angeles 21
RIchmond 8-5828

Beugler Manufacturing Co.
4318 W. 2nd St., Los Angeles 4

Bias Buff—Div. Riegel Textile Corp.
260 Madison Ave., New York 16, N. Y.
111 West 7th St., Los Angeles 14
MAdison 2-2297

Binks Manufacturing Co.
3114 Carroll Ave., Chicago 12, Illinois
4915 Pacific Blvd., Los Angeles 58
LUdlow 1-0136
950 Newhall St., San Francisco 24
ATwater 2-4985
514 Denny Way, Seattle 9, Wash.
MAin 3-1350

G. S. Blakeslee & Co.
1844 - 52nd Ave., Chicago 50, Ill.
356 S. Central Ave., Los Angeles
MIchigan 5657

Bojanower Machinery Service Co.
5270 E. Washington Blvd., Los Angeles 22
ANgelus 3-6175

Bowman Chemicals, Inc.
4606 Long Beach Ave., Los Angeles 58
ADams 1-5101

W. H. Brady Co.
727 W. Glendale Ave., Milwaukee, Wis.
923 E. Third St., Los Angeles 13
MAdison 6-2896
1246 Folsom St., San Francisco 3
HEmlock 1-8480

Braun Chemical Co.
1363 S. Bonnie Beach Pl., Los Angeles 54
ANgelus 9-9311
1400 Sixteenth St., San Francisco 19
HEmlock 1-8800
2930 W. Osborn Rd., Phoenix, Ariz.
ALpine 8-1511
Van Waters & Rogers, Inc.

E. S. Browning Co.
2321 Yates Avenue, Los Angeles 22
RAymond 3-3374
Mariposa & DeHaro Sts., San Francisco
UNderhill 3-6818

Brulin & Co., Inc.
2939-45 Columbia Ave., Indianapolis 7, Ind.
1793 - 12th St., Oakland 7
TEmplebar 6-3004

Carl Buck & Associates
Essex Fells, N. J.
Alert Supply Co.
L. H. Butcher Co.
MacDermid, Inc.

Buckner-Weatherby, Inc.
1743 First Ave So., Seattle, Wash.
MAin 3-5103

Bumstead-Woolford Co.
320 S. W. Stark St., Portland 4, Ore.
CApitol 8-6686
1411 Fourth Ave. Bldg., Seattle 1, Wash.
MAin 3-4915

Burbank Chemical Co.
20 W. Burbank Bl., Burbank
VIctoria 9-1393

The Burhans-Sharpe Co.
906 Weatherly Building, Portland 14, Ore.
BElmont 4-1561
1731 First Ave., S., Seattle 4, Wash.
MAin 2-9006

The E. W. Buschman Co.
4468 Clifton Ave., Cincinnati 32, Ohio
Koop Industrial Sales & Service
Geo. M. Prescott Co.

L. H. Butcher Co.
3628 E. Olympic Blvd., Los Angeles 23
ANgelus 2-4101
15th & Vermont Sts., San Francisco 1
MArket 1-4210
991 "E" St., Brawley
FIeldbrook 4-4281
2050 McKinley Avenue, Fresno 3
AMherst 8-5631
123 East Street, Woodland
MOhawk 2-2878
2750 N. W. 31st Ave., Portland 10, Ore.
CApitol 8-9676
5601 First Ave. S., Seattle 8, Wash.
PArkway 5-8400

By-Buk Co.
4314 W. Pico Blvd., Los Angeles 19
WEbster 6-6151

C & C Buff Co.
4525 E. Floral Dr., Los Angeles 22
ANgelus 3-7573

C-L Chemical Products
14772 Collins Ave., Orange
KEllogg 2-1691

C. M. C. Chemicals, Inc.
114 Sansome Street, San Francisco 4
YUkon 6-3787

Cal Pac Chemical Co.
6004 Walker Maywood, Los Angeles
LUdlow 5-2178

Cal-Tek Industries
1833 N. Eastern Ave., Los Angeles 32
ANgelus 3-7573

California Rack Co.
1012 E. Slauson Avenue, Los Angeles 11
ADams 3-6267

California Smelting & Refining Co.
1549 N. Fishburn St., Los Angeles 63
ANgelus 1-8106

Earle C. Call & Associates
1485 Bayshore Boulevard, Room 381, San Francisco 24
JUniper 5-7411

R. B. Campbell Associates
1001 Westlake Ave., N., Seattle, Wash.
ATwater 4-4370

Campbell Industrial Supply Co.
3433 Airport Way at Spokane St., Seattle 4, Wash.
MAin 2-5567

Carbic-Hoechst Corp.
451-53 Washington Street, New York 13, N. Y.
Westco Chemicals, Inc.

The Carbone Corp.
400 Myrtle Ave., Boonton, N. J.
E. A. Wilcox Co.

Carlson Manufacturing Corp.
4525 East Floral Drive, Los Angeles 22
ANgelus 3-7573

Carborundum Co.
Buffalo Avenue, Niagara Falls, New York
2626 Malt Ave., Los Angeles 22
RAymond 3-4866
Alviso Road and Evelyn Ave., Mountain View
YOrkshire 7-5571
Pacific Abrasive Supply Co.

Carma Mfg. Co.
1879 Mullin Ave., Torrance
FAirfax 8-7536

Casalbi Co.
540 Wayne Street, Jackson, Michigan
E. S. Browing Company

Casey & Case Coating Co.
4630 E. Washington Blvd., Los Angeles
ANgelus 9-7529

Central Solvents & Chemicals Co.
2540 W. Flournoy St., Chicago 12, Illinois
13900 Carmenita Ave., Santa Fe Springs
UNiversity 4-7711 — SPruce 3-3628

Chainveyor Corp.
5618 E. Washington, Los Angeles 22
RAymond 3-4741

Chemclean Products Corp.
15-08 121st St., College Point 56, N. Y.
Absco Welding Supplies

The Chemical Corp.
54 Waltham Ave., Springfield, Mass.
Crown Chemical & Engineering Co.

Chemical Manufacturing Co., Inc.
444 Madison Ave., New York 22, N. Y.
MUrrayhill 8-8700
C.M.C. Chemicals, Inc.
Chemical Manufacturing Co., Inc. of California

Chemical Manufacturing Co., Inc. of California
714 West Olympic Blvd., Los Angeles 15
RIchmond 9-7235

Chemical Process Co.
Box 829, Redwood City
EMerson 6-9586

Chemical Products Corp.
King Philip Road, E. Providence 14, R. I.
9528 Carron Drive, Pico-Rivera
RAymond 3-2760

Chemplate Corp.
3690 S. Santa Fe Ave., Los Angeles 58
LUdlow 7-8205

Chemresearch Co.
2642 Lacy, Los Angeles
CApitol 2-0257

Christie Electric Corp.
3410 W. 67 St., Los Angeles 43
PLeasant 3-2607

Chubco Co.
555 High St., Oakland 1
KEllogg 2-7392

George R. Churchill Co., Inc.
Churchill Road, Hingham, Massachusetts
Carlson Manufacturing Corp.
Industrial Materials Company
Sundmark Supply Company

Circo Equipment Co.
51 Terminal Avenue, Clark, N. J.
Alert Supply Co.

Circo Ultrasonics Corp.
51 Terminal Ave., Clark, N. J.
Hugh Gray Company
The Kennematt Co.

Clementina, Ltd.
2277 Jerrold Ave., San Francisco 24
ATwater 2-7290

F. L. & J. C. Codman Co.
Plain St., Rockland, Massachusetts
Room 202, 704 So. Spring St., Los Angeles 14
MAdison 3-5961
LaGrand Industrial Supply Company

Color-Matic Sales & Service Co.
1750 W. 178th St., Gardena
FAculty 1-4080

Columbia-Southern Chemical Corp.
One Gateway Center, Pittsburgh 22, Pa.
7668 Telegraph Road, Los Angeles 22
OVerbrook 5-7970
625 Market Street, San Francisco 5
YUkon 2-0272
0134 S. W. Ridge Drive, Portland 1, Ore.
CH 4-9926

Commercial Filters Corp.
2 Main Street, Melrose 76, Massachusetts
Montgomery Brothers, Inc.

E. S. Constant Co.
1814 S. E. 7th, Portland 14, Ore.
BElmont 4-9774

Continental Metals, Inc.
7001 Santa Monica Blvd., Hollywood
HOllywood 9-8383

Conversion Chemical Corp.
100 E. Main St., Rockville, Conn.
Alert Supply Co.
Great Western Chemical Co.

Corona Mfg. Corp.
11300 Tuxford St., Sun Valley
TRiangle 7-9818

Cortex Chemicals Co.
734 S. P. Drive, Phoenix, Ariz.

Cratex Mfg. Co.
1600 Rollins Road, Burlingame
OXford 7-1600
Davis Industrial Products Co.
Federated Sales Company
H. F. Soderling Co.

Crown Chemical & Engineering Co.
4722 Worth St., Los Angeles 63
ANgelus 2-1161
2160 Palou Ave., San Francisco 24
MIssion 8-1444
Regulator Engineering & Development Co.

Crown Rheostat & Supply Co.
1965 Pratt Blvd., Elk Grove Village, Ill.
Crown Chemical & Engineering Co.

Currier Co.
205 - 12th St., Oakland 7
TWin Oaks 3-4475

Cyclone Sandblast Equipment
42 Clara Street, San Francisco 7
EXbrook 2-0742

Davis Industrial Products Co.
338 N. W. Sixth Ave., Portland, Ore.
CApitol 8-6211

Dayton Rogers Mfg. Co.
2824 - 13th Ave. S., Minneapolis 7, Minn.
835 W. Los Tunos Drive, San Gabriel
CUmberland 3-7027
Box 182 — Station A, Palo Alto
DAvenport 6-1630

Dean Products, Inc.
1042 Dean Street, Brooklyn 38, New York
3839 Divisardero St., San Francisco 23
WAlnut 2-0985
E. S. Constant Company
Arthur Forsyth Co.
W. Scott Turner & Co.

De Boom Paint Co.
1300 - 22nd St., San Francisco 7
ATwater 2-6310

deCastro & Associates
1301 Olympic Blvd., Montebello
RAymond 3-9477

Decorative Engineering & Supply, Inc.
17000 S. Western Ave., Gardena
FAculty 1-4411

Deer-O Paints & Chemicals, Ltd.
N. Van Buren at 24th Pl., Phoenix, Ariz.
BRidge 5-5444

Delco Chemicals, Inc.
2700 S. Eastern, Los Angeles 21
RAymond 3-9711

Denn-Burr Process Co.
8833 Phillin St., Arlington

Desoto Chemical Coatings, Inc.
Fourth & Cedar Sts., Berkeley 10

Despatch Oven Co.
619 S.E. 8th St., Minneapolis 14, Minn.
H. E. Hartley Company
Lombard Smith Company
Matheson-Doherty

Detrex Chemical Industries, Inc.
14331 Woodrow Wilson Ave., Detroit 32, Michigan
3027 Fruitland Avenue, Los Angeles
LUdlow 8-9214

Detro Sales Co.
3429 Wesley St., Culver City
VE 9-4443

The DeVilbiss Co.
300 Phillips Ave., Toledo, Ohio
6811 E. Slauson Dr., Los Angeles 22
RAymond 3-6307
1335 N. 10th St., San Jose 12
CYpress 7-1820
Star Machinery Company

The Diversey Corp.
1820 W. Roscoe St., Chicago 13, Illinois
525 Market St., San Francisco
GArfield 1-6715
5720 Imperial Highway, South Gate
SPruce 3-4130

Diversified Plastics, Inc.
2129 E. Florence Ave., Huntington Park
LUdlow 8-4218

Divine Brothers Co.
200 Seward Ave., Utica, N. Y.
R. C. H. Supply Co.

Dow Chemical Co.
Midland, Mich.
900 Wilshire Blvd., Los Angeles 17
MAdison 6-0111
350 Sansome St., San Francisco 4
GArfield 1-8323
307 Broad St., Seattle 1, Wash.
MAin 4-6488

Dry Clime Lamp Corp.
Greensburg, Indiana
Grenco, Inc.

Du Bois Chemicals, Inc.
Broadway at Seventh, Cincinnati 2, Ohio
310 S. Mission Road, Los Angeles 33
ANgelus 8-0141

Duhig & Co., Inc.
5105 Telegraph Rd., Los Angeles 22
ANgelus 3-7161
2802 Tenth St., Berkeley 10
THornwall 3-1670

Frank W. Dunne Co.
41st & Linden St., Oakland
OLympic 3-8811

E. I. du Pont de Nemours & Co., Electrochemicals Dept.
Wilmington 98, Delaware
1485 Bayshore Blvd., San Francisco 24
JUniper 6-5141
245 S. Hoyt Ave., El Monte
CUmberland 3-2761 & GIlbert 8-6166

E. I. du Pont de Nemours & Co., Inc., Finishing Div.
1007 Market St., Wilmington 98, Del.
1600 Trousdale Drive, Burlingame
OXford 7-3870

Electric Steel Foundry Co.
6415 E. Corvette Street, Los Angeles 22
RAymond 3-8601

Electro Glo Co.
621 South Kolmar Ave., Chicago 24, Ill.
Laco Engineering & Sales, Inc.

Electrofilm Corp.
7116 Laurel Canyon Boulevard, North Hollywood
POplar 5-4420

The Electrolizing Co.
1505 E. End Ave., Chicago Hgts., Ill.
1947 Hooper Ave., Los Angeles 11
RIchmond 9-7876

Engelhard Industries, Inc.
American Platinum & Silver Div.
113 Astor Street, Newark 2, N. J.
1111 Wilshire Boulevard, Los Angeles
HUntly 2-1800
760 Market St., San Francisco
GArfield 1-1447

Enthone, Inc.
440 Elm St., New Haven, Conn.
L. H. Butcher Co.

Erikson Mfg. Co.
1913 Chico Ave., El Monte
CUmberland 3-3735

Everlube Corp.
6940 Ferndale, No. Hollywood
STanley 7-7101

Federated Metals Div. of Asarco
120 Broadway, New York 5, N. Y.
4010 East 26th St., Los Angeles 23
ANgelus 8-4921
1901 Army St., San Francisco 24
ATwater 2-3340
101 Dakota St., Seattle 4, Wash.
MAin 3-7160
1900 N.W. 18th Ave., Portland 9, Ore.
CApitol 7-1404

Federated Sales Co.
5921 N. Temple City Blvd., Temple City
ATlantic 6-4136

Ferro Corp.
4150 East 56th St., Cleveland 5, Ohio
5309 So. District Blvd., Los Angeles 22
LUdlow 8-9274

Finch Paint & Chemical Co.
20850 S. Normandie, Torrance
NEvada 6-5795

Flexentrik Corp.
555 Fourth St., San Francisco

Formax Mfg. Corp.
3171 Bellevue Ave., Detroit 7, Mich.
Crown Chemical & Engineering Co.

Arthur Forsyth Co.
2800 - 15th Ave., W., Seattle 99, Wash.
ATwater 3-5716

Fostoria Corp.
1200 Main St., Fostoria, Ohio
P.O. Box 4236, Carmel
MAyfair 4-2977

H. J. Fouts and Co.
6253 Hollywood Blvd., Los Angeles 28
HOllywood 4-6511

W. P. Fuller & Co.
301 Mission St., San Francisco 19
YUkon 1-1960
222 N. Avenue 23, Los Angeles 54
CApitol 5-1212
Fairview Avenue North, Seattle, Wash.
MUtual 2-5334

Furane Plastics, Inc.
4516 Brazil St., Los Angeles 39
CHapman 5-5751

General American Transportation Corp.
135 South La Salle Street, Chicago 3, Ill.
900 Wilshire Boulevard, Los Angeles 17
MAdison 8-1357
235 Montgomery St., San Francisco 4
DOuglas 2-8222
Industrial Kanigen Corporation

General Paint Corp.
1002 - 16th St., San Francisco
UNderhill 3-8119

The Glidden Co.
1000 - 16th St., San Francisco 7
MA 1-0200

Golden Plastics Corp.
333 East 8th Street, Oakland 6
GL 2-2160

The Grav-i-Flo Corp.
400 Norwood Avenue, Sturgis, Michigan
Alert Supply Company

Graver Water Conditioning Co.
4050 Buckingham Road, Los Angeles 8
AXminster 5-4421
420 Market St., San Francisco 11

Hugh Gray Co.
2166 Market St., San Francisco
KLondike 2-1777

Great Lakes Carbon Corp., Dicalite Div.
612 S. Flower St., Los Angeles 17
MAdison 9-1611

Great Western Chemical Co.
860 Canal Blvd., Richmond
BE 5-8441
2133 N.W. York St., Portland 10, Ore.
CApitol 6-2451
6900 Fox Ave., Seattle, Wash.
PArkway 5-6350
W. 1133 College Ave., Spokane, Wash.
FA 7-5588

Grenco, Inc.
3654 Cerritos Ave., Long Beach 7
GArfield 7-4302
2035 S.W. 58th Ave., Portland 1, Ore.
CApitol 6-4096

Handy & Harman
82 Fulton St., New York 38, N. Y.
330 N. Gibson Rd., El Monte
CUmberland 3-8181

Hanson-Van Winkle-Munning Co.
100 Church St., Matawan, N. J.
Alert Supply Co.

Harang Engineering Co.
133 Tanforan Avenue, San Bruno
JU 3-7242

Harper Buffing Machine Co.
6 No. Main St., E. Hampton, Conn.
Alert Supply Co.

The Harshaw Chemical Co.
1945 E. 97th St., Cleveland 6, Ohio
3237 S. Garfield Ave., Los Angeles
RAymond 3-3161

H. E. Hartley Co.
Boeing Field - 81, Seattle 8, Wash.
PArkway 5-7120

Heatbath Corp.
Springfield, Mass.
Pentrate Processing Service

Heil Process Equipment Co.
12901 Elmwood Ave., Cleveland 11, Ohio
Wooldridge Company

Carl Herrmann Associates
291 Lambert Avenue, P.O. Box 1179, Palo Alto
DAvenport 6-6033
551 E. Walnut Street, Pasadena
SYcamore 2-0702

Hill Brothers Chemical Co.
1133 N. 22nd Ave Phoenix, Ariz.
ALpine 8-4866
44 W. 6th St., Tucson, Ariz.
MA 4-8082

Hodge Supply Co.
11537 Ruthelen Avenue, Los Angeles 47
PLymouth 4-3792

Hooker Chemical Corp.
P.O. Box 344, Niagara Falls, N. Y.
6277 East Slauson Ave., Los Angeles 2
OVerbrook 5-8910
P.O. Box 1646, Tacoma 1, Wash.
FUlton 3-2661

E. F. Houghton & Co.
303 W. Lehigh Ave., Philadelphia 33, Pa.
54 Tanforan Avenue, South San Francisco
VAlencia 4-3207

R. O. Hull & Co., Inc.
1301 Parsons Court, Rocky River 16, Ohio
161 Industry Road, LaHabra
LAmbert 6-1023
Crown Chemical & Engineering Co.

Hydra & Power-Blast Mfg. Div., Automation Services, Inc.
Post Office Box 5554, Detroit 38, Michigan
Alan Baker Company
Crown Chemical & Engineering Co.

Hydro-Hone Co., Div. of Gemair, Inc.
7516 Pacific, Huntington
LUdlow 7-7112

Illinois Water Treatment Co.
840 Cedar Street, Rockford, Illinois
Burhans-Sharpe Company
H. J. Fouts and Company

Industrial Heat Systems
6938 Farmdale Ave., N. Hollywood
TRiangle 7-0659
B & T Equipment Co.
Mechanical Equipment Co.
Tyee Machinery Co.

Industrial Instruments, Inc.
89 Commerce Road, Cedar Grove, N. J.
Alert Supply Company
L. H. Butcher Co.
Crown Chemical & Engineering Co.
Infilco, Inc.
Laco Engineering & Sales, Inc.
Metal & Thermit Corp.
G. H. Vaughan Co.

Industrial Kanigen Corp.
1421 Park Avenue, Emeryville

Industrial Materials Co.
383 Brannan St., San Francisco 7
Exbrook 2-8505
1203 Pine St., Seattle, Wash.
MAin 2-8575

Industrial Oven & Equipment Co.
1640 N. Indiana, Los Angeles
ANgelus 1-3149

Industrial Plastic Fabricators
Endicott St., Norwood, Mass.
385 E. Green St., Pasadena
SYcamore 5-2611
160 Santa Clara Ave., Oakland 10
OLympic 5-6068

Industrial Rack Co., Inc.
614 W. Colorado, Glendale 4
CHapman 5-7696

Industrial Systems Co.
32 Main St., Matawan, N. J.
Chubco Co.

Industrial Systems, Inc.
5615 Leeds St., South Gate
SPruce 3-4521

Industrial Tool & Supply Co.
1177 N. 15th St., San Jose 12
CYpress 2-8853

Infilco, Inc.
901 S. Campbell Ave., Tucson, Ariz.
MAin 3-5401
1485 Bayshore Blvd., San Francisco 24
JUniper 7-7852
6404 Hollywood Blvd., Hollywood 28
HOllywood 4-9281
323 E. McDowell Rd., Phoenix, Ariz.
ALpine 3-7564
Martig's, Inc.

International Nickel Co., Inc.
67 Wall St., New York 5, N. Y.
716 W. Olympic Blvd., Los Angeles 15
RIchmond 9-2496

International Rectifier Corp.
1521 E. Grand Ave., El Segundo
OREgon 8-6281

Ionic Electrostatic Corp.
111 Monroe Street, Garfield, N. J.
Overspray, Inc.

Jackson Buff Co.
21-03 41st Ave., Long Island City, N. Y.
2041 S. Davie Ave., Los Angeles
PArkview 1-5579

Jackson Chemical Co. of Calif.
6920 Stanford Ave., Los Angeles 1
PLeasant 2-6161

Jaxon Engineering Specialties
185 Stuart Street, San Francisco
YUkon 2-7055

Jordan Air Supply
2914 Leonis Boulevard, Los Angeles 58
LUdlow 1-0133

Kelite Corp.
81 Industrial Rd., Berkeley Heights, N. J.
1250 N. Main St., Los Angeles 12
CApitol 2-0201

The Kennematt Co.
14637 Bessemer St., Van Nuys
TRiangle 3-2427

Kent Rotary Equipment Co.
1507 Downy Rd., Los Angeles 26
ANgelus 1-5632

L. R. Kerns Co.
2659 E. 95th St., Chicago 17, Ill.
630 N. Batavia St., Orange
KEllogg 8-9621

Maurice A. Knight
P.O. Box 111, Akron 9, Ohio
505 Hollingsworth Bldg., Los Angeles 14
MAdison 2-1996
220 Cutting Blvd., Richmond 4
BEacon 5-5780

Kocour Co.
4800 S. St. Louis Ave., Chicago 32, Illinois
Alert Supply Company
L. H. Butcher Co.
Crown Chemical & Engineering Co.
Great Western Chemical Co.
Harshaw Chem. Co.
Industrial Materials Co.
Laco Engineering & Sales, Inc.
Charles F. L'Hommedieu & Sons Co.
Sundmark Supply Co.

Koop Industrial Sales & Service
916 S.E. Sandy Blvd., Portland 14, Ore.
BElmont 4-8188

Koppers Co., Inc.
Chemicals & Dyestuffs Division, Koppers Building, Pittsburgh 19 Pennsylvania
2313 East 8th St., Los Angeles
MAdison 3-4468
55 New Montgomery St., San Francisco 5
DOuglas 2-3364

Kubro Manufacturing Co.
1833 Palo Santo Drive, San Jose
FRanklin 8-8730

Laco Engineering & Sales, Inc.
1228 S. Atlantic Blvd., Los Angeles 22
ANgelus 9-0777

LaGrand Industrial Supply Co.
15 S.W. Arthur St., Portland, Ore.
CApitol 7-3683

Laramy Products Co.
Cohasset, Massachusetts
Electric Steel Foundry Co.
Golden Plastics Corporation
Paramount Plastics Fabricators

Lasalco, Inc.
2828 La Salle St., St. Louis 4, Mo.
Laco Eng. & Sales, Inc.

Lea Manufacturing Co.
16 Cherry Ave., Waterbury, Conn.
Atlas Chemical & Manufacturing Co.
L. H. Butcher Company
Crown Chemical & Engineering Co.
Great Western Chemical Co.
LaGrand Industrial Supply Co.
Los Angeles Chemical Co.
Pearson & Smith Company

Lea-Ronal, Inc.
139-20 109th Avenue, Jamaica 35, N. Y.
L. H. Butcher Company
Crown Chemical & Engineering Co.
Sundmark Supply Company

L. W. Lefort Co., Inc.
2335 E. 52nd St., Los Angeles 11
LUdlow 8-3251

J. W. Leser Co.
4408 West Jefferson Blvd., Los Angeles 16
REpublic 1-4173

Chas. F. L'Hommedieu & Sons Co.
4521 Ogden Ave., Chicago 23, Ill.
6052 Ferguson Dr., Los Angeles 22
RAymond 3-3231

Lindberg Products Co.
P.O. Box 908, Lakeport

Loco Engineering & Sales, Inc.
1228 S. Atlantic Blvd., Los Angeles 22
ANgelus 9-0777

Lombard Smith Co.
714 West Olympic Blvd., Los Angeles 15
RIchmond 8-5345

Los Angeles Chemical Co.
4545 Ardine (South Gate), Los Angeles
LUdlow 3-4761

Los Angeles Water Softener Co., Inc.
1007 Air Way, Los Angeles 2
CHapman 5-1854

The Lowe Brothers Co.
424 East Third Street, Dayton 2, Ohio
490 Grand Avenue, P.O. Box 4326, Oakland 10
TEmplebar 2-3889

Oliver B. Lyman Co.
55 New Montgomery St., Rm. 701, San Francisco 5
SUtter 1-6438

M & E Manufacturing Co.
2571 Winthrop Ave., Indianapolis 5, Ind.
542 Brannan Street, San Francisco
GArfield 1-7389
Jordan Air Supply

M-F Equipment Co.
410 Frelinghuysen Ave., Newark 12, N. J.
Alert Supply Co.
Campbell Industrial Supply Co.
Color-Matic Sales & Service Co.

Maas & Waldstein Co.
2121 McCarter Highway, Newark 4, N. J.
Smith-Davis Co.

MacDermid, Inc.
526 Huntingdon Ave., Waterbury, Conn.
18802 Fonthill, Torrance
DAvis 3-6292

W. D. MacDermid Chemical Co.
Bristol, Conn.
Laco Engineering & Sales, Inc.

The Macintosh Co.
3030 Bridgeway, Sausalito
EXbrook 2-1412

Magna Coatings & Chemical Corp.
1785 N. Eastern Ave., Los Angeles 32
ANgelus 1-7111

Magnus Chemical Co., Inc.
South Avenue, Garwood, New Jersey
1360 Boston Street, Altadena
VAndike 9214
2307 18th Ave., N., Seattle, Wash.
EAst 3-4169
Jaxon Engineering Specialties

The R. C. Mahon Co.
6565 E. Eight Mile Rd., Detroit 34, Mich.
821 Market, San Francisco
EXbrook 7-1060
2303 Jefferson, Torrance
NEvada 6-5761

Martig's, Inc.
5741 N.E. Glison St., Portland 13, Ore.
BElmont 2-1949
422 Smith Tower, Seattle, Wash.
MAin 3-6622

The Matchless Metal Polish Co.
840 W. 49th Place, Chicago 9, Illinois
715 W. Caldwell St., Compton

Matheson-Doherty
225 Shaw Road, South San Francisco
PLaza 5-7920 or JUno 9-2323

Mathews Paint Co.
598 W. Ave. 26, Los Angeles
CApitol 1-2111

B. W. McIntyre Co.
7031 Darby Avenue, Reseda
DIckens 3-8086
Alert Supply Co.

McKenna Laboratories
2503 Main St., Santa Monica
EXbrook 9-8846

McKesson & Robbins, Inc., Mefford Chemical Branch
5353 Jillson Street, Los Angeles 22
ANgelus 9-9531

The Mearl Corp.
41 East 42nd St., New York 17, N. Y.
S. L. Abbot Company

Mechanical Equipment Co.
222 S. Hinton Ave., Scottsdale, Ariz.
WHitney 5-6369

Mefford Chemical Co.
5353 Jillson St., Los Angeles 22
ANgelus 9-9531

Merit Products, Inc.
3691 Lenawee, Los Angeles 16
UPton 0-4694

Metal Improvement Equipment Co.
1721 E. 47th St., Los Angeles
ADams 2-7248

Metal & Thermit Corp.
Rahway, N. J.
923 E. Third, Los Angeles
OREgon 8-5186

Michigan Chrome & Chemical Co.
8615 Grinnell, Detroit, Mich.
13251 Hewes, Santa Ana
KEllogg 8-4768

Microbeads, Inc.
P.O. Box 241, Jackson, Miss.
128 Sleepy Hollow, Orinda

Mido Products
1801 Border Ave., Torrance
FAirfax 8-6916

Milbro Engineers
11620 Wright Road, Lynwood
NEvada 6-0565

Carl F. Miller & Co.
2450 Sixth Ave., S., Seattle, Wash.
MAin 4-6668

Millhorn Chemical & Supply Co.
6507 Compton Ave., Los Angeles 1
LUdlow 3-4588

Missimers Inc.
3737 San Fernando Road, Glendale 4
CHapman 5-8471

The Mitchell-Bradford Chemical Co.
Wampus Lane, Milford, Conn.
Crown Chemical and Engineering Co.
R. C. H. Supply Co.

Montague-Harris & Co.
893 Folson Avenue, San Francisco
YUkon 2-4365
5301 Pacific Blvd., Huntington Park
LUdlow 3-2331

Montgomery Brothers, Inc.
Filter Division
1053 South Olive Street, Los Angeles 15
RIchmond 7-5191
1122 Howard St., San Francisco 3
UNderhill 1-3527
1632 N.W. Johnson, Portland 9, Ore.
CApitol 3-4197
911 Western Ave., Seattle 4, Wash.
MAin 4-7297

NRC Equipment Corp.
160 Charlemont St., Newton 61, Mass.
499 Hamilton St., Suite 205, Palo Alto
DAvenport 6-3455
Carl Herrmann Associates

George L. Nankervis Co.
15300 Fullerton Ave., Detroit 27, Mich.
L. H. Butcher Co.

National Research & Chemical Co.
12520 Cerise Ave., Hawthorne
OSborne 5-7121

National Ultrasonic Corp.
111 Montgomery Ave., Irvington 11, N. J.
Carl Herrmann Associates
Carl F. Miller & Co.

Neilson Chemical Co.
2300 Gainsboro, Detroit (Ferndale) 20, Mich.
3411 Union Pacific Ave., Los Angeles 23
ANgelus 2-3291

J. G. Neuner Co.
1261 Long Beach Blvd., Long Beach 13

New England Lead Burning Co.
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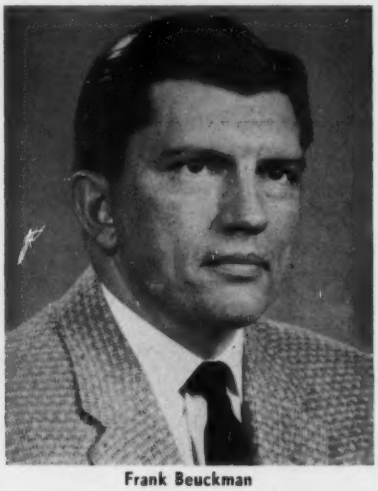

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Sealing Anodized Aluminum

SODIUM SULFITE IMMERSION TEST

By W. E. Cooke and R. C. Spooner, *Aluminium Laboratories Ltd., Kingston, Ontario, Canada*

THE sealing of anodized aluminum significantly improves the resistance of the surface oxide film to staining and corrosion and, in the case of colored work, increases the wash-and-light-fastness of the dyed film. Normal procedure is to immerse the work in boiling water. Factors influencing the rate and degree of sealing are anodic film thickness and quality, sealant pH, temperature, time, and water purity.

Recent experience with automotive trim components has re-emphasized the need for consistent high-quality sealing and, particularly, for an improved method to determine the degree of sealing of treated parts. Such a test for sealing must discriminate readily between well and inadequately-sealed material. In addition, it must be cheap, rapid, and easily carried out with a minimum of equipment and facilities.

A number of tests are in use or have been proposed, but each lacks one or more of the desired features. The ASTM dye test[1] does not discriminate well between partially and well-sealed material. While some improvement can be obtained by use of non-aqueous dye solutions or a dye more readily absorbed, such as Aluminum Golden Orange RLW, this test lacks the desired sensitivity. The acetic acid modified salt spray test,[2] although generally considered a corrosion test, can also be used to indicate the degree of sealing. After 8-20 hours exposure the degree of "bloom" (a uniform cream color) early distinguishes the efficiency of the seal. However, the prolonged time required rules it out as a means of production control. Similar objections can be raised against the use of the sulfur dioxide humidity test.[3] The resealing weight gain technique,[4] developed recently in this laboratory, lacks high sensitivity in the desired range and requires a good laboratory balance and careful technique to obtain the required accuracy.

A new test has been described by Kape,[5] which requires immersion of the test-piece in a warm acidified sodium sulfite solution for only a few minutes. The resultant bloom provides a direct measure of the degree of sealing and work with it in this laboratory indicates that the technique meets the requirements outlined above. The solution, as developed by Kape, is made up by dissolving 10 g./l. anhydrous sodium sulfite in water, adjusting the pH to 3.75 with glacial acetic acid, and further adjusting the pH to 2.5 with 5 N sulfuric acid. The purpose of the acetic acid is to reduce the evolution of sulfur dioxide. Test conditions are not rigid, although 30 minutes at 90-98°C. was suggested by Kape. The solution can be used at least twice before discarding but it has the disadvantage that it cannot be used indefinitely. In addition, the test does not provide information on the pitting resistance of the anodic coating; this characteristic can be obtained only in a more prolonged test such as the acidified salt spray. Our experiences with the sulfite solution immersion test are outlined below.

Visual Standards

An arbitrary numerical system of rating based on visual standards is as follows:

Rating	*Visual Appearance After Test*	*Degree of Bloom*
5	Little or no change	None
4	Very light bluish tinge	Very light
3	Light bluish tinge	Light
2	Bluish grey	Moderate
1	Grey or white	Heavy
0	Coating removed	None

A rating of 3 or higher after treatment is considered acceptable, whereas, 2 or lower is cause for rejection. The borderline case for acceptance or rejection of a lot naturally will depend on the actual service conditions envisaged for the material. Only unsealed or very poorly sealed material will be rated at 0. It should be noted that, with bright-anodized material, only small visual differences (primarily in brightness) exist between ratings of 5 and those of 0; the latter is really detected by the common flashlight and battery test.

Effect of Variables

EFFECT OF SEALING TIME:

Bright-anodized AA5457 alloy with a 0.3 mil anodic

TABLE I

Degree of Sealing Revealed by Sodium Sulfite Immersion Test

Influence of Film Thickness and Sealing Time.

Film Thickness (mils)	0.3			0.6				1.1				
Sealing Time (mins)	0	5	15	0	5	15	30	0	5	15	30	60
Time in Sodium Sulfite Solution (mins)												
7	1	3	5	1	2	5	5	1	1	5	5	5
14	0	2	5	0	1	5	5	1	1	5	5	5
30	0	1	5	0	1	5	5	0	1	5	5	5

film was sealed for 0, 1, 5, and 15 minutes under otherwise optimum sealing conditions, i.e. fresh, boiling, deionized water at pH 6.0. After testing in the acidified sodium sulfite solution at 90°C. for 7.5 minutes, the following ratings were assigned:

Seal Time (minutes)	*Rating*
0	0
1	0
5	1
15	5

Additional results on the effect of sealing time are presented in Table 1; these data were obtained at 85°C. and, hence, slightly longer treatment times are required to achieve the same rating as is obtained at 90°C.

EFFECT OF ANODIC FILM THICKNESS:

As shown in Table 1, film thickness is not specifically measured by the test. However, it is well known that, as thickness increases, a longer time is required for an equal degree of sealing to occur, and this is shown by the results. It can also be seen that, regardless of film thickness, 15 minutes treatment provides adequate sealing (as measured by the test).

EFFECT OF SEALING TEMPERATURES:

Other specimens of AA5457 alloy with a 0.3 mil anodic film were sealed for 15 minutes in fresh, deionized water at pH 6.0 and various temperatures, then tested at 85°C. for a 7.5 minute period. The results were as follows:

Sealant Temperature (°C.)	*Test Rating*
100	5
95	4
90	3
80	2
70	1
unsealed	0

The importance of the temperature of the seal water on the degree of seal obtained is to be noted. Even a temperature as high as 95°C. produces a seal inferior to that produced at 100°C.

EFFECT OF OTHER VARIABLES:

Kape showed that the test could discriminate between the sealing efficiency of various natural or treated waters,[5] and our work confirms this. Our experience also shows that poorer sealing caused by too low a sealant pH, i.e. below 5 with certain tap waters, can be clearly demonstrated by this test.

EFFECT OF TESTING TIME:

As shown in Table 1, the length of time in the sodium sulfite solution is not critical except that, with thin films, prolonged treatment will remove the coating. However, with longer test periods, slightly better discrimination is obtained. It is suggested that 10 minutes at 85°C. should be considered standard.

CORRELATION WITH OTHER TESTS:

Excellent correlation has been obtained between this test and (a) the acidified salt spray, (b) the SO_2 humidity and (c) the resealing weight gain tests. The natural salt spray test[6] is often specified as an acceptance test for anodized products. Our experience is that it provides little or no discrimination between unsealed and well-sealed material; hence, it has practically no correlation to the other sealing tests, and is, at best, a poor test of film thickness.

Conclusions

The above results clearly indicate the ability of the sodium sulfite immersion test to discriminate between well and partially sealed anodic films on aluminum. The method is rapid, economical, and does not require material other than that present in the average finishing shop. A set of standards, representing the various numerical ratings, can be produced readily and used for comparison with unknowns. It is recommended that the sodium sulfite immersion test should be considered carefully by all who need a simple, rapid test for degree of sealing of anodic coatings.

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Precise Barrel Finishing

By Ralph F. Enyedy, *Westinghouse Electric Corp., Electronic Tube Division, Elmira, N. Y.*

SOMEONE has said that, in early days, armorers loaded pieces of their handiwork in barrels or casks, together with stones and earth, and had them rolled by serfs about the medieval courtyards to produce a desired finish befitting the Lord Knight's particular demands. Be such a story fact or fancy, it does illustrate the barrel finishing method, even if crudely arrived at. (Fig. 1)

Most of our present barrel finishing processes employ rotating barrels, or drum-shaped containers into which parts are placed, with or without media, to be subjected to the mixing and rubbing action resulting from the rolling of the "barrel."

Such departures from this method are described later, but at first let us concern ourselves with the rotating container type of machine and its processes.

Why Finish by Barrel?

The question well may be asked, "Why should we finish parts by barrel methods when, for years, we have achieved satisfactory finishes by hand and wheel polishing, or removed flash and burrs with files, wheels, wirebrushes, countersinks, cutting tools, and sanding belts?" Actually, often accompanying this question, expressions of grave doubts about consistent results,

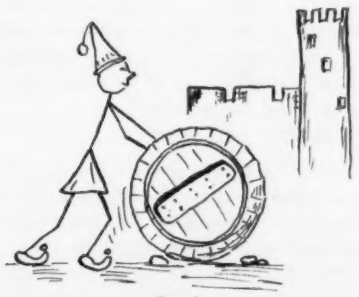


Fig. 1.

removal of seemingly inaccessible burrs, and damage to parts arise.

Economy usually is the first consideration when barrel finishing is contemplated. Processing of a multitude — tens, hundreds, thousands — of parts at a time, with each part receiving exactly the same treatment as all others, allows considerable time saving over one-at-a-time, hand methods. And, in addition, very satisfactory cost reductions are achieved frequently on large pieces which require treatment for deburring, polishing, or other finishing at several points on their peripheries, when run singly in a barrel load. In such a case, the labor to load and unload the part and media, in and out of the barrel, can be a fraction of the manual time expended in filing, or otherwise treating several points on the part.

Newer quality demands can influence the choice of barrel finishing. Whereas, in the past, hand finishing methods may have been entirely acceptable, later, more sophisticated demands for elimination of all tool marks, as an example, or removal of apparent places where one cut overlapped another, may require exceedingly skillful hand operations not always readily accomplished. The barrel method of grinding or polishing often can achieve full roundness at points where such contours are required, and polish or burnish to extreme microfinishes. If we attempted to file a rounded knob to eliminate tool marks or blend the parting lines where one forming tool had not quite matched with another, much time would be spent in careful touching-up and, very likely, some out-of-roundness would become apparent. To the contrary, in a proper barrel finishing cycle myriad, small cutting points attack projections first, leveling them to surrounding areas, while comparatively smooth areas receive less abrasion. The resulting finish can be practically unblemished.

Complete burr removal can be very provoking, in some instances. Sometimes machining operations, used to remove burrs at one point, cause burrs or projections at another, less accessible point. Countersinking, to remove burrs at the mouth of a hole, frequently causes a rolled-up burr at the top of the countersink and inside the hole at the minor diameter of the countersink. Reaming may be necessary to remove the latter, while some other additional operation is indicated to flatten the former burr. If simply removing the burr from the hole were required, barrel finishing could be the answer. In the event a countersunk hole were demanded, barrel finishing could, in many cases, eliminate the burrs at both top and bottom of the countersink.

Again, some process engineers specify flattening operations to flush burrs on stampings. Usually, each piece requires separate handling to place on the flattening die and, at times, some subsequent operation is employed to remove the metal which was not removed, but only squeezed to another location — at the edge. Barrel finishing is capable of complete removal of piercing and blanking burrs on stampings and can be used to round edges fully.

Consistent results, load after load, can be expected with barrel processes provided they are controlled by definite specifications, and also provided parts are approximately the same so far as size of burr, or starting finish, are concerned. The advantage of such a condition of expectation is apparent. A question may arise at this point; how can specifications be set up with definite assurance of consistency when burrs, such as those thrown by drilling

tools, can vary so greatly in size? Some conditions must be accepted, in such a case. It is true that, although in some plants tools are watched to prevent excessive burr-throwing (limits are frequently established for tool preservation), other shops are negligent in insisting on prompt tool sharpening, and do not discourage "punching out" holes in drilling operations. When conditions are not controlled, the barrel finishing operator can adjust time of the cycle, or make other provisions to adequately finish the worst condition of parts which he will encounter.

Damage to parts is inexcusable with proper application of barrel finishing methods. Any parts which could offer complications should first be tried in one or several ways to determine the least costly but most applicable method of finishing. When the most desirable method is established, no departures should be allowed without a trial. Eggs, electronic tubes, chinaware, and finest jewelry pieces are smoothed, cleaned, ground, and otherwise treated by barrel finishing. The method should be given every consideration for cost saving over hand methods, and for gaining results often impossible to produce by other means.

The foregoing may give the impression that barrel finishing can be applied to every finishing problem, and that it is always the least costly and most satisfactory method for achieving results. To deliberately provoke such attitudes is not the intent of this article. However, it is felt that considerable thought should be given to barrel processes whenever problems of finishing are met.

What Are the Barrel Finishing Processes?

Often, barrel finishing is referred to as a "process," as if one method, any type of barrel machine, some water, a handy detergent and, perhaps, a readily available bulk medium constitute the ingredients with which all "tumbling" can be done. Nothing is farther from the truth!

Practical finishing engineers know that many methods are exploited to make the most of the science. Intelligent manipulation of variable factors contained in a wide choice of machines, special compounds for particular results, media designed for exacting finishes, and water levels, load heights, and barrel speeds contribute to consistent, load-after-load accomplishment of desired processing. In addition, parts themselves vary in size, shape, malleability, and metal (or other) content. Each variation in the products requires its own consideration in the manipulation.

Barrel finishing is a scientific application (despite those who contend it is an art) which benefits most those who are resourceful and "artful" in its use — apply their knowledge of results to be gained by more or less liquids, higher or lower load levels, or ratio of parts to media volumes, and other considerations.

Precise results are expected today of finishing in these ways. An enlightened management need no longer fear mangled, disfigured, or otherwise unusable parts, or rework which could cost more than the alleged savings anticipated by "tumbling." Provided the proper means of accomplishing precise barrel finishing are made available to those charged with the work, satisfaction will be obtained. But what about the processes?

Speaking in simplest terms, if parts were placed within a container, and the container rotated, action such as shown in Fig. 2 would result: parts lying against the bottom of the container would tend to move with the container surfaces until resistance with the surfaces decreased (a) because the weight of the mass no longer held them, whereupon, pushed by other rising parts, they would slide down over the mass at (b), to be influenced again by the barrel's inner surfaces at (c). Such an action, with parts alone in the container would furnish little desirable result. Corners and edges would dub-over, and some projection might be broken off. To barrel finish with a purpose, some other action is required.

Barrel finishing now is used for many resultant purposes: micro-finishing of surfaces, edge-rounding, burnishing or otherwise "coloring" or polishing, selective deburring, cleaning, descaling, surface-hardening. To achieve these purposes, processes may be simple for, let us say, "self-tumbling," to quite complex where selective deburring of fragile or complicated products is required.

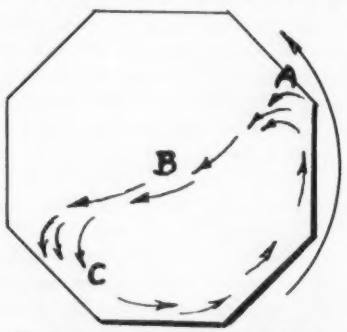


Fig. 2. Arrows show direction of rotation.

If, to the parts (washers as an example) mentioned in connection with Fig. 2, we added a powdered abrasive, and some water to keep the abrasive suspended somewhat, as parts slid down, or in some way rubbed against each other or the barrel surfaces with the grit between them, some grinding would take place. To make our example further illustrative, the water in the mass would act like a lubricant. Its lubricating qualities would partially prevent grinding of smooth surfaces on the parts, but burrs or other projections which ruptured the lubricating film of water would be exceptionally vulnerable to cutting or grinding by the grit rubbed against them. Deburring and some surface smoothening would be the inevitable result. The process described is called "self-tumbling" because no massive media is entailed.

Some further consideration is practical at this point. The film of water mentioned would have some lubricating effect on the smoother surfaces of the parts, as said before. To provide more protection for some surfaces we could introduce soap powder in the mass. On the other hand, if more overall grinding action were desired, introduction of an agent which would reduce the surface tension of the water would allow the grit to cut more readily at all points on the parts. And, further, if all grit were absent during the rolling, but water and soap compound were used with the parts, no grinding would result, but rather smoothing, due to parts, laving, kneading, and otherwise polishing each other.

Self-tumbling has been touched on lightly, above. Further considerations are given later. But, what about barrel finishing of fragile parts which cannot bear impingement, one with another, or parts which could tangle, parts which need edge-rounding, or those needing internal treatment?

Going back to the washer example, let us assume that a completely radiused edge is required. It is obvious that minimum edge-rounding could result if only parts' action against each other, with grit between were depended

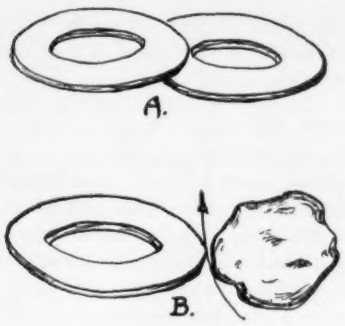


Fig. 3.

on (Fig. 3a). Edge-to-edge contact would be momentary, and natural orientation, one part to another, would be to lie flat. However, introduction of stone-like media, (called "chips") to the load, in a ratio of about 1 volume of parts to 3 volumes of chips, could provide grinding surfaces to grind corners of the parts' edges (Fig. 3b), rubbing considerable abrasive surface on the edges at each contact. Here, again, use of a detergent (not a lubricant) would make grinding more effective and would provide an additional function: cleaning of the chips' cutting edges to keep them more exposed. Contrariwise, in an example where chips or other massive media were used, but excessive radiusing of edges was NOT desired, use of soaps or other lubricants instead of detergents would inhibit cutting. This is mentioned to exhibit resourceful use of variables to achieve an end result.

Media are used also to cushion and separate parts which might tangle or bump each other with enough force to cause damage. There being a great variety of media to choose from, as discussed later, selection of a type which will serve the above purposes and also provide the desired finishing result is possible. In precise barrel finishing, especially of fragile or easily damaged parts, the ratio of volume of parts to media is very important, as is the height of the entire load, the water level, and the speed of rotation of the barrel. Until dealt with specifically in a later section, it should be stated generally that (1) the more fragile or vulnerable the part, the greater should be the ratio of media to parts volume, (2) the higher the load in the barrel, the less severe will be the action, (3) the higher the water level, the slower will be the cutting action, but the better will be the refinement of finish, (4) the greater the speed of the barrel, the faster will be the cutting action — until such time as the mass tends to hold to the barrel surfaces by centrifugal forces, and (5) the larger the pieces of media, the faster will be the working action, and the coarser will be the finish.

With these thoughts in mind, let us go through several processes, step by step.

Self-Tumbling to Deburr and Polish

To self-tumble properly, certain characteristics must be necessarily inherent in the parts, and it also should be understood that the results gained will be peculiar to that type of barrel finishing. Our much used example, washers, is typical of the shape of pieces which will self tumble readily. Spherical or oval parts, many screw machine products such as sleeves, rivets, hubs, etc., flat punch press parts, and others, depending on the location of their burrs, lend themselves to this type of treatment.

Location of burrs to be removed should be considered before a decision to self tumble is reached. We cannot hope to remove burrs inside the holes of hubs, for instance, by self tumbling, because the larger exterior dimensions of the hubs cannot reach within the holes to contact such burrs. On the other hand, burrs elsewhere on the surfaces of the pieces can be contacted easily and ground by other pieces. Generally, self tumbling is practical for removing surface burrs from pieces which will not cling to each other, injure each other on contact, or are not so large, or so shaped that they prevent a smoothly flowing mass during rolling in the container. (Fig. 4)

There are economic advantages to be had with self tumbling, in that no time is used for loading into the barrel any bulky materials other than the parts, themselves, no labor is required to separate parts from media after unloading, and more parts can be run in a barrel load than would be the case if media were used.

To grind-off burrs, or to smooth surfaces of parts tumbled in this way, some kind of "grit" or powdered abrasive must be added to the load. Proprietary compounds, containing powdered abrasives and some or all of such ingredients as water softeners, detergents, and oxidation inhibitors, are available from many suppliers of barrel finishing materials and equipment. For the sake of simplicity, we can classify abrasive compounds in two categories: short cycle and long cycle. The former are adequate for tumbling to grind through 2 to 3 hour periods. Being cheaper, they are more economical for use in "short" runs. They also have a too-little recognized advantage, that, when run for extended periods of time, the abrasive fractures and becomes continually smaller and smaller, thereby causing finer and finer cutting with ultimate polishing effects.

Long cycle compounds contain such abrasives as carbides or aluminum oxides which are capable of "holding-up" and aggressively cutting for extended periods. They, also, can be purchased combined with agents for water softening, detergency, and inhibition.

Some operators prefer to use abrasive powders of their own choice, which they introduce in the barrel along with dry or liquid non-abrasive compounds, also of their own choice. There can be dollar saving advantages to making-up one's own compounds in that way and, furthermore, stocking of many varieties of materials for specialized uses sometimes can be avoided.

Several manufacturers of abrasive compounds recommend the use of 1 lb. of compound per gallon of water used in the load as the correct concentration for self-tumbling to grind. Lacking specific recommendations, the 1 lb. per gallon ratio is a practical one to try but, if available, manufacturers' recommendations on use of compounds should always be followed.

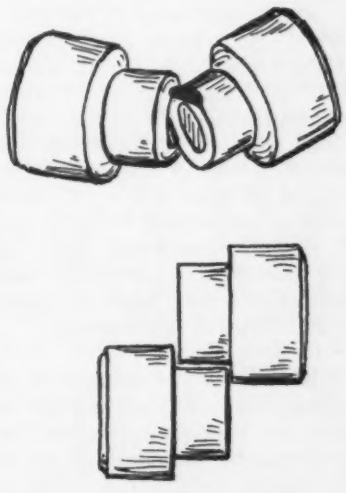


Fig. 4

Water levels for self tumbling to deburr should be from "just under" the load's surface to slightly over the top of the mass. It should be remembered that the less water used, the smaller amount of compound necessary for proper finishing. Adjustment of water level should be made so that the smallest amount of water is used that still allows a fluid mass.

Although, in later discussions on barrel finishing with media, it will be demonstrated that variations in the height of the load mass are important factors to adjust, in self tumbling load heights are generally fixed. To promote best action, in the latter case, the height of the mass (if leveled off) should be 50% to 60% of the barrel's interior height, in horizontal barrels. In tilt-type, or oblique barrels, the maximum load that will stay contained, without flowing over the edge during rolling must be determined in each case. Tilt angle, speed of the particular barrel, and even characteristics of the parts prevent definite recommendations, here, but the determination of maximum loads in such an event is not difficult.

Speed of rotation of the barrel is important in that, when parts are rolled too slowly, less grinding action takes place and more time is required to finish the work, whereas, excess speed not only can extend grinding time but, also, can cause throwing of parts away from the mass so that damage can be incurred. In open tilt-type barrels, action of the mass can be observed and adjustments readily made to provide a smoothly flowing, "waterfall" effect within the mass. Horizontal barrels do not allow observation of the action, however. As a guide, if parts being processed are fairly sturdy, such as 0.020″ thick stampings, of cold-rolled steel, approximately 2″ in diameter or smaller, the speed of an 18″ diameter barrel could be as high as 35 rpm. A suggested speed for a 24″ barrel would be 20 rpm and, for a 30″ barrel, 15 rpm. More fragile parts than those mentioned, or parts of the same thickness but of larger diameters, should be tried at slower speeds.

Tumbling time, or duration of the grinding run, obviously depends on size of the burrs to be removed but, less obviously, also depends on the hardness of the material being deburred and, furthermore, can be influenced by the materials' content and the accessibility of the burrs. Here again, recommendations suiting all conditions would be foolhardy, but some guidance is possible. The washer described, unhardened, would require about 2 hours of tumbling to remove blanking burrs. Mill or drill burrs on unhardened steel pieces could demand 2 to 5 hours of running time — in extreme cases, even more. Removal of grind burrs from flat hardened parts often can be accomplished in a 2 hour run. The above are indications for rough guidance in determining tumbling times. Actually, any part contemplated for barrel finishing is deserving of a trial run to exactly fix such a variable factor as duration of grinding.

One more variable which should be discussed immediately is type of barrel to use for self tumbling. Without going into relative merits of types at this time, it can be said that oblique, "regular" horizontal, triple-action "wheel multibarrels," and others are capable of this method of finishing.

Size of the barrel best suited for the circumstances depends on the volume of parts available for processing, and on the individual part's size, in some cases. A small volume of parts tumbled in a large barrel would develop little or no waterfall action and, since practically no weight of the mass would press parts to barrel surfaces, minimum grinding would occur. Reference to Fig. 5 will quickly illustrate effects of load heights, and help in judgment of size of barrel to use.

Fig. 5a shows a load which will undergo maximum action. It is quite generally agreed that the greatest amount of grinding in the mass takes place during the "slide" or point where a layer of pieces slips down over the parts in the mass which are moving upward with the barrel's surfaces. A load which provides a long slide, therefore, is the most desirable.

With too large a volume of parts and, for that matter, too small a volume (Figs. 5b and 5c), slide may be reduced from very short to practically zero. We should expect some grinding to take place in a load such as shown in Fig. 5b because some friction between parts and against barrel surfaces will be caused by movements throughout the mass, but results will be very much slower in achievement. A very small load such as in Fig. 5c will not receive effective grinding unless run in a much smaller container, or unless the load is built up with media to a height well up in the barrel.

Typical routines for processing by self-tumbling follow. The demonstration of an oblique barrel in the example does not mean that other types would be less desirable.

1. Raise the tilt of a medium-size, clean barrel to about 35° to 40°.

2. Dump-in about 3000 pieces (2″ diameter, 0.025″, unhardened, C.R.S. stampings) of parts.

3. Measure-in water to just over the top of the load.

4. For each gallon of water introduced, measure-in 1 lb. of a proprietary short cycle abrasive compound.

5. Turn on the barrel, and let it run 1 to 2 hours (observe results).

6. Turn off the barrel and lower the tilt, allowing the parts to dump into wire mesh baskets. Rinse out the barrel, well.

7. Dip the baskets, with the contained parts, into a hot water rinse tank.

8. Dump the parts into a centrifugal drier. After drying, the parts can be stored for several hours without rusting, if rust inhibitors are contained in the abrasive compound.

The parts treated as above will have a matte finish, and may have some impregnation of grit. In some cases, those conditions may be acceptable. In other cases, however, some subsequent operation, such as press forming or drilling, could require grit-free parts lest dies or other tools be damaged. To clean the parts in the barrel, with mini-

Fig. 5.

mum handling, let us go back to item 5 of the above routine, and continue as shown:

6b. Turn off the barrel and lower the tilt far enough to allow the water to run off, but not so far that the parts spill out.

7b. With a hose, rinse out as much grit and silt as possible then, again, uptilt the barrel to the same running angle as in 1.

8b. Again, measure-in water but, this time, fill to about 2″ to 3″ over the top of the mass.

9b. Measure-in a cleaning compound. 2 to 4 oz. of compound per gallon of water can be used if manufacturers' recommendations are not known.

10b. Run the load for about ½ to 1 hour.

Continue through items 6, 7, and 8 above. Drying in a tilt barrel containing dry hardwood sawdust or ground corncob material would further assure grit removal.

In the event a matte finish is not satisfactory, polishing could be accomplished by interrupting the above cycle after 7b., and carrying on a polishing process, thus:

8c. Measure-in water to a level about 2″ over the mass.

9c. Measure-in a burnishing compound; about 4 oz. per gallon of water, or an otherwise recommended amount.

10c. Run the load 1 to 4 hours (observe finish).

Continue through items 6, 7, and 8. Sawdust or corncob material drying will remove water stains if centrifugal drying is not quite satisfactory.

The foregoing is an attempt to demonstrate, in a general way, the steps of a self-tumbling process. It should be repeated that various types of barrels could have been utilized.

Self Tumbling for Other Purposes

Descaling and plate-stripping of hardened, oxidized, and plated parts is often more economical by tumbling methods. The general routines outlined above serve as a guide for the mechanical procedures to accomplish the wanted results. Descaling and stripping operations usually are 2-cycle operations; one for removing the unwanted covering on the material, and the other for neutralizing liquids still present after rinsing, or to introduce oxidation inhibitors.

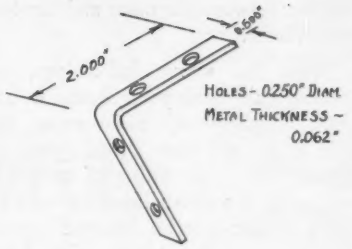


Fig. 6.

Cleaning and degreasing can be accomplished by rolling parts in detergent or degreasing solutions, and by the aforementioned use of hardwood sawdust or ground corncob material.

Self-burnishing is possible when small parts of smooth shapes, such as balls, grain kernels, pins, etc., are run with soap or other burnishing compounds for considerable time — 12 to 24 hours are not uncommon.

Barrel Finishing with Media

Certain conditions and results may be thought of as common to all barrel finishing operations employing media, but it should be borne in mind that each type of media is designed for specific results not shared by all others. Later discussion of each medium type will attempt to define its special applications but, for the present, we can proceed on the basis of general tumbling with barrel loads consisting of parts, together with other bulk materials.

Media are used (1) to separate parts, one from another, to prevent peening or tangling, (2) to reach points on parts which are inaccessible otherwise, (3) to cushion and provide free-flowing characteristics to the load, (4) to promote aggressive finishing at edges or other points, and, (5) to build up height and weight of the mass.

If some parts, let us say brackets such as shown in Fig. 6, were run in a barrel without other massive material, they would lock together, cluster into bunches and, quite likely, become bent or distorted by the erratic movements of the clusters during the rolling. Moreover, very little desired grinding or other finishing would be apparent.

To finish edges of the illustrated products, aluminum oxide chips could be used in a ratio of perhaps 4 volumes of about 1″ diameter chips to 1 volume of parts. In that ratio the tumbling of the mass would closely resemble the action that would occur if the chips alone were rolled.

More successful finishing would very likely be gained by rolling such parts as the brackets in a horizontally rotated barrel rather than in an oblique type. In the former, parts could not escape good mixing with the chips, whereas, in the latter barrel type a tendency would develop for the parts to move toward the mouth of the barrel and cluster, thereby losing intimate contact with the media.

Introduction of a "chip grinding compound" (one containing water softening, detergent, and other properties) in this method of grinding promotes rapid cutting action of the abrasives contained in the chips. Some suppliers of compounds recommend 2 oz. of compound to each gallon of water introduced in the barrel. With some compounds an excessive amount used can inhibit cutting by forming a lubricating film on the parts. On the other hand, too weak a concentration can defeat the purpose of the compound, which is to clean parts' and chips' surfaces and diminish the natural lubricating effect of water.

Water levels have a decided effect on results obtained when tumbling with chips and similar media. High water levels of, let us say, 3″ to 4″ over the mass of parts and chips will prolong cutting time, but will result in fairly refining surfaces on the parts. Low water levels instead will decrease cutting time, but some sacrifice in surface finishing must be expected.

Height of level of parts and chips in the barrel must be adjusting to the fragility of the pieces being worked. Higher levels are compelled by more fragile parts. In some instances, extremely delicate parts may require almost complete loading of the barrel, preventing all slide action, and depending entirely on the comparatively gentle action which takes place throughout the mixture of parts and media. A device for preventing tangling and bumping of delicate parts at the outset of the barrel's starting is to put successive layers of media and parts in the barrel, so placing the parts that the next succeeding layer of media flows about each one.

Fairly substantial parts such as the bracket in Fig. 6 can be finished with

a load height about 60% up the inside diameter of the barrel.

Barrel speeds should be discussed precisely at this point. The action shown in Fig. 7 is ideal for most applications, and is obtained when speed and load heights are properly regulated. Parts and media rise with the barrel's rotation, as at (A), break smoothly over and away from the barrel surfaces (B), slide in a thin layer, down over the balance of the load (C), to be again influenced by friction with the barrel surfaces (D), and started through the cycle again. During the migrations, parts and media from the center of the load displace those in the outer layers of the load and vice versa.

Keeping volume of the load constant, we can exploit the changes which take place when speeds are varied. If barrel rpm is increased, the height to which particles are carried (B) increases. Slide becomes steeper, the downcoming layer at (C) moves more rapidly, and action becomes more severe. Still higher speeds could cause particles to rise with the barrel to a point (perhaps X) where gravity would cause them to drop freely to the load below. Under such conditions, fragile parts could be mutilated and, in addition, sliding would be minimized. So, there is a point beyond which conditions are undesirable even with the most rugged parts.

Now, turning to the opposite tack, slowing down of the barrel's rpm would reduce the height of the point (B), and diminish the rapidity of the slide. Carried to an extremely slow barrel speed, all slide would be eliminated. Then, the only action would occur within the very gentle shifting throughout the mass and some little friction between the mass and the barrel surfaces.

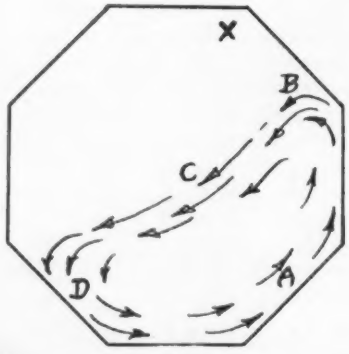


Fig. 7.

From the above indications, extremely vulnerable parts should be run with comparatively high water and load levels, and slow barrel rpm's, together with high ratios of media to parts. On the other hand, when tumbling comparatively "rugged" parts, higher speeds, lower levels of load and water, and lower ratios of media to parts can be used to gain more rapid action but, of course, with some sacrifice in surface finishing. The routine for barrel finishing the brackets shown in Fig. 6, with chips, would approximate the following. A medium size horizontal barrel is demonstrated to depict use of some auxiliary handling equipment, loads being of enough volume to justify such methods. The first routine outlines a process for removing burrs and slightly radiusing edges:

1. Jog the barrel to a position that will allow introduction of parts and media by use of a hoist pan. (Fig. 8)

2. Dump about 1000 parts into a hoist pan.

3. Add to the load in the hoist pan a volume of 1″ aluminum oxide chips equivalent to 4 times the volume of parts.

4. By hoist, lift the pan of parts and media and dump the load into the barrel.

5. After disposing of the pan, run water from a hose into the barrel, to a level 2″ over the load.

6. Measure- in a chip-grinding compound (about 2 oz. per gallon of water).

7. Securely fasten the barrel cover, making sure pressure-relieving devices are free.

8. Turn on the barrel and allow it to run for 3 hours.

9. Stop the barrel, jogging so the opening is about 45° above the horizontal.

10. Carefully remove the cover, making sure pressures within are completely relieved before fully removing.

11. Replace the solid cover, with a screening, or perforated door.

12. Turn on the barrel, allowing the liquids to slosh out through the door. Turn-off and run-in water until it overflows through the opening in the screening door.

13. Again, turn on the barrel and let the water slosh out.

14. Turn off the barrel, locate the hoist pan beneath the barrel, and remove the screening door.

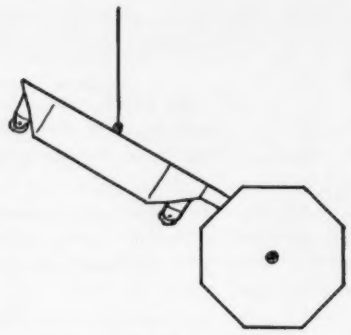


Fig. 8. Loading a large barrel.

15. Jog the barrel carefully, allowing media and parts to flow out from the lowered mouth of the barrel into the hoist pan.

16. With the water hose, thoroughly rinse out all silt from the barrel, and then rinse the parts and chips well.

17. By hoist, lift and move the hoist pan, and dump the load into the hopper of a magnetic separater.

18. Place the separated parts into wire mesh baskets, dip in hot water, and dry in a centrifuge, oven, or sawdust barrel.

In cases where some additional cleaning or where polishing of the parts is necessary, the above cycle should be interrupted immediately after step 13. For adding a cleaning cycle the following steps can be used:

14b. Turn off the barrel and jog to the filling position. Remove the screening door.

14c. With a hose, run in water to a level about 4″ over the mass.

14d. Measure-in an excessive amount of chip-grinding compound (say, about 4-5 oz. per gallon of water), or about 4 oz. per gallon of burnishing compound.

14e. After putting the regular barrel covering in place, turn on the barrel and let it run 15 to 20 minutes.

14f. Carry on with items 9 through 18 above.

To polish under the above conditions, a burnishing or polishing compound, not a chip-grinding compound, should be used in 14d. and the running time in item 14e. could be 2 to 6 hours, depending on the finish needed. Otherwise, the cycle for polishing could be the same as demonstrated for cleaning.

(To be continued)

FINISHING POINTERS

Plating Bath Limits

By J. B. Mohler
Seattle, Wash.

A SUPERINTENDENT in a silverware plating plant once pointed to a bath that was known to be 50 years old. The age of a solution raises an interesting academic question. What minute trace of the original salts or even the original water might still be present? Very little to be sure but one thing is certain: the bath was properly controlled for a very long time. In contrast, many plating baths have been dumped and remade after only months of service.

The basic method of plating within bath limits was discussed in a previous "Finishing Pointer."[1] However, to apply control one must first have limits. Many bath compositions are given without limits and we cannot help but speculate why this is so? The author, in many instances, has had no direct experience with the bath and is merely repeating the formula from another source. The limits then may not be well established. Also, they may not be the best applied to an intended application. Even if limits are specified, they should be accepted with caution. A broad range may be given that covers more than one bath and should be broken down to several smaller ranges. Again, the bath may merely be a general formulation.

Limits are important. The characteristics of a silver cyanide bath will change markedly as the bath composition is changed. Variations of nickel baths are formulated to produce strike deposits, a wide plating range, heavy, hard, or bright deposits.

Sooner or later one is faced with the problem of operating a bath that is new to his experience. If the bath is to be put to limited use, then one need not be concerned with control of all variables. If, on the other hand, the bath is to be used extensively, then limits should be set as a first step.

Take, as a popular example, the high pH Watts type bath:[2]

Nickel sulfate	32 oz./gal.
Nickel chloride	6 "
Boric acid	4 "
pH	4.5-6.0
Temperature	115-160°F.
Current density	20-100 amp./ft.^{2}

This is a general formula, intended as a guide, with various suggested applications and wide temperature and current density ranges, so that there is considerable latitude within the ranges given. These are not intended as control limitations on a single application, but rather as ranges that should not be exceeded in any application. This too, is the basic bright nickel bath and definite limits are specified by many proprietary processes. Then again, a great deal of experimental work has been done with his bath so that the functions of each chemical have been defined.

The first step in setting limits on a bath is to consult the recommendations of a recognized authority, such as a vendor. Suppose now that we have decided to use this bath at a low current density to favor throwing power and cathode efficiency but at a high temperature to favor soft deposits. No range is set on current density but rather a fixed value, say 40 amp./ft.^{2} Temperature should be controlled without setting the range unnecessarily narrow. 5° should be satisfactory, as 130-135°F.

The chemical composition expresses the bath make-up. Since the chemicals will be depleted with use, the given concentrations represent the high limit.

Consider now a similar bath recommended as a nickel strike.[3] Here the same basic bath has been applied to a specific use and limits are closely defined:

Nickel sulfate	27-32 oz./gal.
Nickel chloride	6-10 "
Boric acid	4- 6 "
pH	2.0-3.0
Current density	20-40 amp./ft.^{2}
Temperature	105-115°F.
Time	5 minutes

A variation of 15% is allowed in the nickel sulfate concentration and more than double this percentage in the other two chemicals. However, this is a strike bath limited to 5 minutes plating time.

The chemical limits should be sufficiently wide that they will not be difficult to control and sufficiently nar row that the character of the deposit will not change as the bath changes. A good guess on safe and yet controllable limits on our bath is:

Nickel sulfate	29-32 oz./gal.
Nickel chloride	5- 6 "
Boric acid	3- 4 "
pH	4.5-5.5
Temperature	130-135°F.
Current density	40 amp./ft.^{2}

The limits should be specified as "tentative," indicating that they should be held but are subject to revision if experience shows that a change would be beneficial.

It is well to explore the limits a bit by means of plating range tests: Make up a bath with each of the chemicals on the low limit and plate a test panel. Increase each chemical singly to the high limit and plate a test panel after each increase. Continue until all chemicals are at the high limit. The test panels will indicate any shift in plating range due to normal variations in a controlled bath. If changes are negligible, the procedure may be repeated with wider tentative limits. This, however, is only a preliminary testing procedure. As such, it indicates the plating range alone and should not be regarded as a final test. More extensive testing

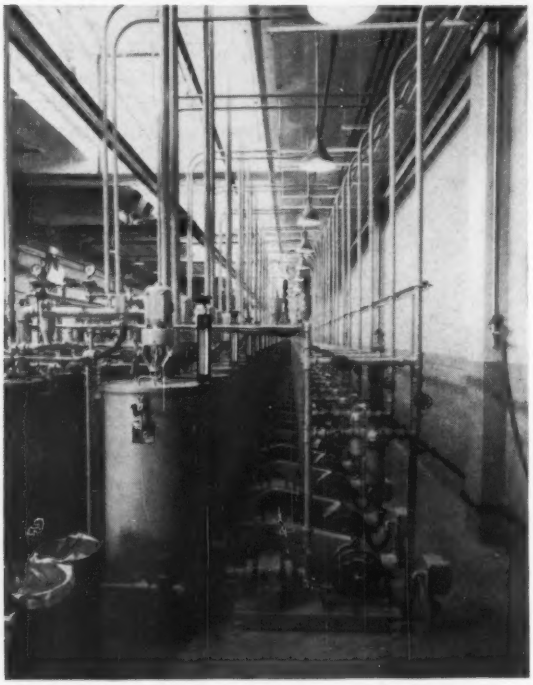
(*Continued on page* 99)

Painting System Meets Many Demands

By Ralph Fifield, *Binks Mfg. Co., Los Angeles, Calif.*

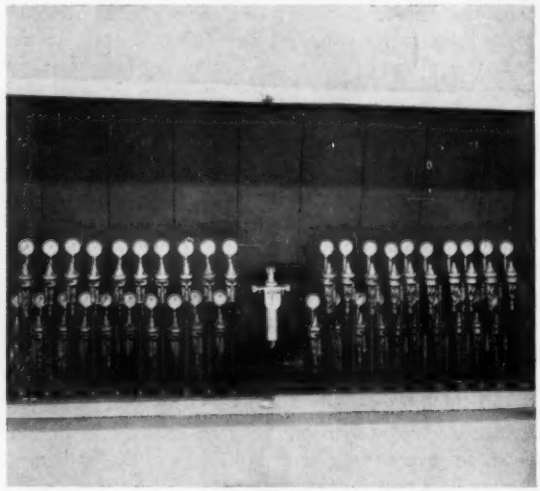
MOST automobile buyers consider good looks — exterior styling, interior design, and color — more important than utility. In fact, consumer studies reveal that the average auto buyer takes utility for granted. That's why two-tone paint jobs and ingenious style are being emphasized in the stiff competition for the consumer's dollar. Now that both American and foreign manufacturers are in the race, a wide range of color choice is an absolute must.

Of course, recognizing a buying habit is not enough. Delivering good-looking automobiles on a high-production schedule involves care, planning, and automobile painting design. Automobile painting systems must meet requirements for diversified color schemes, available instantly as the automobiles come by for finishing at a rapid production rate. The automobile manufacturer usually turns to the spray painting equipment manufacturer to get the technical guidance and assistance needed in the design and installation of painting systems. The teamwork pays off in solving even the most difficult problems. For example, the circulating system installed in Ford Motor Co.'s Ford-Mercury in Pico Rivera, Calif., is able to supply paint in forty different colors, plus material for coating, primer, and surfacing. Details of the system, which is typical of those in the firm's assembly plants across the country, show stringent daily demands it is geared to handle.



General view of the paint mixing room at Ford Assembly Plant, Pico Rivera, Calif. These sixty-gallon tanks feed the paint circulating system that provides color to the automobile spray booths. Also in the same room are containers for miscellaneous coatings for frames, parts, etc.

First of all, the system must conform to the many general requirements, called out in specifications. Two separate painting systems are required — one for the main circulating system capable of handling 50 jobs per hour, and another for the final car repair paint system. Paint temperature cannot fall below 70°F. at any time. The system must also be capable of supplying approximately two gallons of enamel for each automobile body per coat on body. The entire system must meet the company's industrial equipment standards, and pass fire insurance inspection.

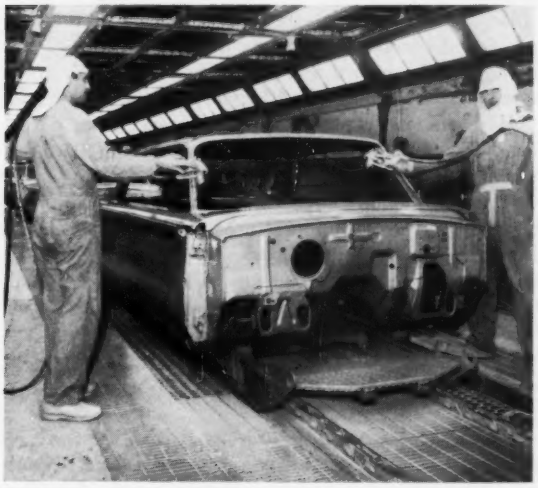


A typical spray station in one of the spray booths at Ford. Each of the forty outlets provides a different color, and each has its own material regulator.

Specifically, the circulating system at the Pico Rivera plant must supply a total of 13 automobiles or parts spray booths. These booths have from one to ten spray stations. Each spray station has from one to forty material outlets. All told, the system must serve a total of 1,658 material outlets. Seven of the thirteen spray booths are used only for color spraying. Each booth must supply forty different colors. One booth is devoted exclusively to painting wheels. This booth must supply fifteen different colors. The remaining booths are used for painting frames, lower parts, fenders, or body surfacing.

Since the demand for different colors varies so much, it is not practicable to schedule a block of automobiles through the production line for any one color. The spray painter in the booth may have to paint one car black, the next one red, the next one green, etc. The system enables him to switch instantly from one color to another. Forty color outlets at each spray station in any given booth make this quick change possible. As a painter finishes applying one color to a car body, he disconnects his hose from one outlet by means of a quick disconnect and connects it to the outlet that provides the color required for the next car. After he clears his spray gun of the first color by discharging it into an exhaust until the next color flows through the gun, the painter is ready to paint the next part.

At the Pico Rivera plant, practically all assembly operations take place on the first floor of the building. All spray painting operations, with the exception of the frame spray booth, the wheel spray booth, and final car repair is done on the second floor. Here is how this system works. When an automobile body reaches the point where it is ready for painting, it is



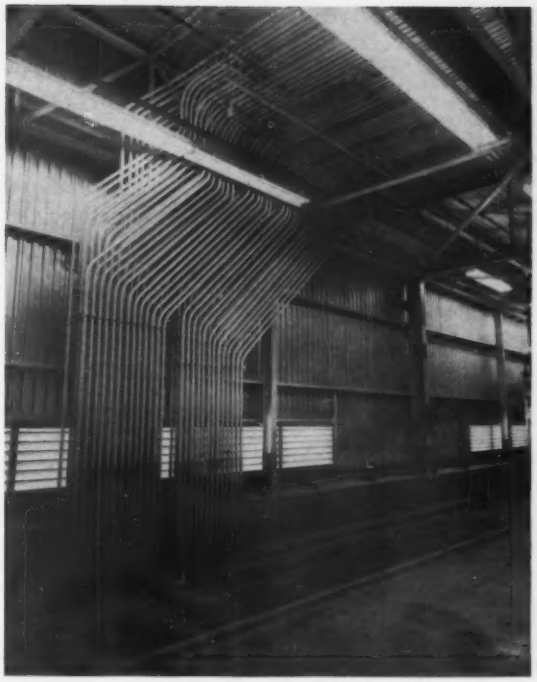
Car body has been masked just prior to its entry into the spray booth, and will pass directly into drying oven after it is painted. Conveyor moves constantly, so paint and air pressures must be extremely reliable.

taken off the assembly line and moved to the second floor on an elevator. From the elevator, the body moves onto a heavy-duty floor-mounted conveying system, and begins its trip through the spray painting operation.

Preparation for Painting

The first step is a metal preparation booth. Here the body passes through a phosphating process, followed by the necessary rinsing and drying. On the second step, the body passes through the prime booth, prime dry oven, and wet sanding operation. It then passes to one or more of the color booths. As each color is applied, the body moves from the spray booth direct to the drying oven. All masking is done while the body is on the conveying system and before it enters the booth for another color application.

After body finishing is completed and the body has



All lines from the paint mixing room enter the spray painting area at a common point. Quick closing connector valves reduce fire hazard.

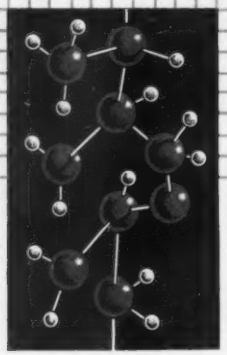
passed inspection, it is taken by elevator back to the first floor assembly operations, and rejoins the assembly line at the proper point.

All of the spray booths, including the frame spray booth and the wheel spray booth on the first floor, are supplied by a paint circulating system. The heart of this system is the paint mixing room, where all the paint is prepared and stored, ready for use. This room is on the ground floor adjacent to the spray painting area.

All piping leaves the paint mixing room at a common point, and all return lines lead back to the paint mixing room at the paint point. Thus, all piping is concentrated in one small area. All lines are 1¼-inch seamless steel tubing. All supply lines run to the ceiling of the spray painting area and proceed across the area, feeding each spray booth in turn.

Pressure is maintained in the system by means of electrically-driven pumps. These pumps supply pressure of 75 psi to the entire system, and a maximum discharge pressure of 100 psi. Pumps used in the main and auxiliary paint system are rotary gear pumps, and those used for the 150 gal. tanks which supply the primer, surfacer, and underbody coating are of the piston type. Pump capacity is 9 to 20 gpm at 850 rpm.

Additional equipment that was supplied with the system included paint filters — one for each line — modulating valves, and pressure gauges. Fluid regulators are installed in each line at each station in order to insure minimum variation of pressure at the spray gun. Each spray station is also equipped with two air outlets. All these components, as well as the major part of the system, conform to Ford's specifications.



SYNTHETIC RESINS

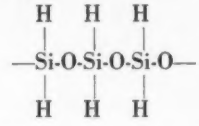
The Backbone of Modern Finishes

A SURVEY OF THE LATEST DEVELOPMENTS IN SYNTHETIC RESINS USED IN COATINGS

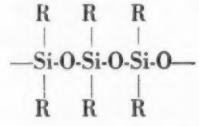
Part II - Silicones

By Harold P. Preuss

THE non-metallic element silicon is second only to oxygen in abundance on the earth. Compounds of silicon, oxygen and hydrogen are known as siloxanes, or silicones. These have the structure:



Replacement of the hydrogen atoms by hydrocarbon radicals results in compounds having this formula:



These are known as *polyorganosiloxanes*. "R" in the above formula may be the $-CH_3$ radical, or it may be a $-C_2H_5$, or $-C_6H_5$, or more complex radical.

Silicones are produced in the form of fluids, compounds, greases, resins, and elastomers, or in other forms. Silicones in the form of resins are chiefly used in coating formulations. These have the structure exhibited by the polyorganosiloxane grouping illustrated above and, when used in formulating protective coatings, are generally applied as solvent solutions.

Very broadly, silicone resins can be divided into two groups — the pure silicone resins and the silicone/organic copolymers.

There are different types of pure silicone resins depending upon the "building blocks" used to synthesize them. They vary in such properties as toughness, hardness, curing speed, mar resistance, and compatability with other silicones as well as with conventional organic resins.

Applications for Silicone Coating Resins

Silicone coating resins have extended the temperature range in which paint is useful. Aluminum coatings for temperatures above 1000°F. and decorative coatings for temperatures up to 550°F. are now routinely made with these resins.

Typical applications for such high temperature aluminum paints are boiler stacks, exhaust stacks, mufflers, furnace and oven exteriors, high temperature processing equipment, exhaust manifolds and jet engine components.

In addition to these uses of metal pigmented coatings, there are many applications where white and colored silicone paints and enamels are needed for adequate protection under specified service conditions.

Home incinerators and reflectors for certain types of light that generate high heat are coated with straight silicone or high silicone content enamels. Various colored and iridescent metallic finishes are used to provide decorative as well as protective coatings for space heaters, ovens, and other appliances and structures subjected to elevated temperatures.

High silicone content copolymers have been developed for service slightly less rigorous than that for which pure silicone resins are used. Certain areas of ranges or other industrial items may be subjected to moderately high temperatures, such as 350-450°F. Lamp shields on ranges may not even get to 350°F. but are exposed to fumes and steam from cooking and to general warm air aging. These conditions cause conventional baking enamels to yellow, but finishes based on high silicone copolymers with the proper organic intermediate will remain as white as the porcelain working areas.

In multi-color metal decorating, the baking temperature may not be excessive but a white background may be required to remain white through three or four, or more successive bakes. Conventional baking enamels are hard pressed to survive, but a silicone copolymer does with ease.

Resins of this type have been formulated into white appliance finishes and found to possess many other desirable properties in addition to a high heat resistance. Hardness, mar resistance, flexibility, and resistance to soap, vegetable fat, and fruit juice have placed such finishes high in appliance finish ratings.

In addition, they have been found impervious to immersion in JP-4 jet fuel and petroleum based aircraft hydraulic fluid.

Types and Source of Silicone Coating Resins

In this article we will discuss the products of three United States manufacturers of basic silicone resins and intermediates. These are the Dow Corning Corporation, with principal offices in Midland, Michigan; the General Electric Company, whose Silicon Products Department is in Waterford, New York, and the Union Carbide Corporation, Silicone Division, with general offices in New York City. These companies produce a

TABLE I

Typical Properties of Silicone Resins for Use in Coatings

Properties as Supplied	*DOW CORNING*					*GENERAL ELECTRIC*					*UNION CARBIDE*	
	804	805	806A	808	840	82	111	112	119	120	R-64	XR-630
% Solids	60	50	50	50	60	60	50	50	55	65	65	60
Solvent	toluene	xylene	xylene	xylene	toluene	xylene	toluene	xylene	xylene n-butanol	xylene n-butanol	toluene	xylene
Wgt./Gal. (lbs.)	8.8	8.4	8.5	8.4	8.8	8.9	8.4	8.4	8.65-8.85	8.6-8.8	9.0	8.5
Color	lt. straw	lt. straw	lt. straw	lt. straw	lt. straw	straw	straw	straw	pale straw	lt. straw	lt. straw	lt. straw
Color Gardner (Max.)	2	2	2	1	2	6	6	6	—	3	2	—
Viscosity, cp. @ 25°C.	20-40	80-150	100-200	100-250	15-20	5-30	50-100	50-100	30	200-350	16-54	100-200
Viscosity, Gardner-Holdt	A-3 to A	C to F	D to H	D to J	A-1 to A-3	A-5 to A-2	A-D	A-D	—	H-N	—	D-H

Fig. 1. Silicone-based stack enamels vs. corrosion resistance. After air drying, one end of each panel was heated over a Bunson burner to 600°F. and subjected to 100 hours of salt spray.

variety of silicone coating resins tailored for specific uses.

All of them fall into Classification No. 8 mentioned in the first article of this series. The details of manufacture of these resins are of course trade secrets; but, in any event, such information is outside the scope of this article. What each resin will accomplish is described in the sections which follow. Properties of silicone resins for use in coatings are shown in Table I.

Dow Corning Resins, Intermediates and Additives

Silicone products made by Dow Corning for use in compounding industrial coatings are as follows:

Resin 805. This resin forms flexible films with good aluminum leafing properties and outstanding heat resistance. It is used primarily in aluminum and zinc dust coatings where maximum stability is needed at temperatures of 1000°F. and more. Metallic paints made from Resin 805 are used on stacks, mufflers, boilers, jet engines, exhaust manifolds, heat exchangers, and other high temperature equipment. When cured 1 hour at 480°F., protective coatings based on the resin have excellent weather and corrosion resistance. Figure 1 illustrates the heat and corrosion resistant properties of a straight silicone enamel based on Resin 805.

Resin 806A is a hard, nonflexible material often blended with Resin 805 in aluminum formulations to increase toughness and improve drying properties. It is also used to make colored enamels with excellent hardness and adhesion at service temperatures up to 450°F. This resin will air dry tack-free, but requires a cure of 1 hour at 480°F. for optimum film properties.

Resin 808 is a flexible silicone resin that combines outstanding heat resistance with excellent gloss retention, and is used in colored baking enamels for service

temperatures up to 550°F. Decorative finishes based on this resin have excellent adhesion, color and gloss retention, and corrosion resistance. They are used on space heaters, clothes driers, stoves, and other appliances where color and gloss retention at elevated temperature is important.

Resin 840 is compatible with many organic resins, and is blended with them to improve their heat stability and weather resistance. The color and gloss retention of high temperature decorative finishes is greatly improved by blending 40 per cent (in light colored finishes up to 70 per cent) Resin 840 with the base resin; such coatings can be used at continuous temperatures up to 400°F. Aluminum coatings containing 10 to 35 per cent Resin 840 will resist 1200°F. for short periods. Silicone-ceramic coatings based on Resin 840 and ceramic frits are serviceable up to 1400°F.

Resin 840 may also be added in small quantities (0.1 to 1.0 per cent) to organic finishes (such as epoxy, phenolic and alkyd) to improve initial gloss, flowout, and wetting, and to reduce pigment grinding time.

Resin 804 is a hard resin with excellent color and gloss retention and good heat stability at temperatures up to 400°F. It is compatible with many organic resins and is blended with them to improve heat stability and water resistance. It has also been used to coat the impeller blades of jet aircraft, to seal electrical equipment, and as an additive to basing cements for vacuum tubes.

Sylkyd 50 is a flexible, low molecular weight, reactive silicone intermediate. It can be processed with many organic protective coating resins and monomers to produce resins having improved thermal stability, moisture resistance, weather resistance, and electrical properties of many of these materials.

Z-6018, a low molecular weight silicone intermediate, reacts with many organic protective coating resins and monomers to form resins having improved heat stability, moisture resistance and weatherability.

It can be processed by either solvent or fusion techniques, using conventional methods and equipment. (See later section on Copolymer Formation.)

Fluids 200, 510 and F-4290 are silicone additives used in protective coatings to prevent silking or bubbling, to improve mar resistance or surface appearance, and to create hammer finishes. In general, 510 Fluid is more compatible with organic resins than is 200 Fluid. For greater convenience and accuracy, these fluids are usually added as a one per cent stock solution in solvent. Suitable solvents include aromatic hydrocarbons, chlorinated solvents, and mineral spirits. F-4290 can be added to baking enamels, air-drying enamels, and lacquers to produce hammer finish effects. Silicone fluid additives are normally added to protective coatings after processing is complete. These fluids are effective at very low concentrations and care must be exercised lest residual silicones in processing equipment change the appearance of later batches. Just as the properties of silicone additives are unusual, so also the effects they create in protective coatings may be unusual or unexpected. Therefore, it is always recommended that the application of these silicone additives to specific formulations be carefully tested prior to use in a plant run.

General Electric Resins and Additives

Silicone products made by General Electric for use in compounding industrial coatings are as follows:

Resin SR-82. This polymer is widely compatible with organic materials, and this makes it possible to formulate silicone-containing products having properties intermediate between those of the pure organic and pure silicone materials by simply cold blending. Resin SR-82 is a hard resin that air dries to a tack free film which, when cured, has good solvent resistance. It is suggested primarily as a blending resin. In the range of 25% of total vehicle solids, it upgrades the heat service life of organic blends very markedly. At 2-5% it improves weather durability. At the same concentration in clear varnishes, it has improved brushing and holdout on bare wood, thus enhancing both film build and gloss. 1% of Resin SR-82 (based on epoxy resin content) acts as an effective flow control agent in coatings based on these resins.

Resin SR-111 has been designed specifically for use as a vehicle in formulating heat and weather resistant protective coatings. This resin combines high heat resistance with an unusual balance of flexibility, hardness and curing speed. In addition, colored formulations based on Resin SR-111 have shown gloss retention at temperatures in the 500-550°F. range. Protective coatings based on Resin SR-811 have been used on such things as ovens, space heaters, incinerators, appliances and structures subject to elevated temperaatures. However, Resin SR-111 is not recommended for aluminum finishes, because of its zinc catalyst. Resin SR-112 is suggested for such applications.

Resin SR-112 is also designed for use as a vehicle for high heat and weather resistant coatings. Like Resin SR-111, it possesses an unusual balance of flexibility, hardness and curing speed. Aluminum finishes based on Resin SR-112 exhibit superior performance in weathering and atmospheric corrosion resistance at temperatures up to and including the 1000°F. range. Colored enamel finishes, based on Resin SR-112, show color and gloss retention and film integrity after many weeks of nearly continuous exposure at 500°F. (periodically cooled for very short intervals for inspection). Coatings based on this resin have been used successfully on boiler stacks, furnaces, space heaters, incinerators, jet engine parts and exhaust manifolds. Resin SR-112 is compatible in varying degrees with such organic resins as: ethyl cellulose, acrylics, chlorinated diphenyls, melamine formaldehydes, ureaformaldehydes, alkyds and phenolics.

Resin SR-119 exhibits the highly desirable qualities of superior hot hardness, fast baking, versatility of baking schedule and thermal shock resistance. It may be used as a clear coating or as a vehicle for high grade, heat resistant coatings. In either case, it demonstrates excellent adhesion not only to steel but also to glass.

Resin SR-120 is a baking type silicone resin copolymer for use in formulating heat resistant enamels. Properly catalyzed coatings will cure in 30 to 60 minutes at 350-400°F. to give decorative and protec-

tive finishes for service between 400°F. and 500°F.

This resin lends itself particularly to white and light colored enamels. Such enamels have compared favorably with good alkyd-aminoplast type finishes, and are far superior to conventional silicone types in film hardness, mar resistance, flexibility, impact resistance and adhesion to metals. Test panels subjected to heat shock tests have passed 10 cycles of 24 hours at 440°F. followed by an immediate quench in 70°F. water without showing signs of film failure. Enamels have also shown good resistance to oils, fats, greases, chemicals and effects of weathering.

Finishes prepared from SR-120 silicone resin are suggested for applications such as space, wall, and floor heaters, furnace and kitchen range parts, commercial ovens, incinerators, small appliances, furnace and appliance controls, and high temperature handling and processing equipment.

Fluid SF-69 is a clear, low viscosity silicone additive. It is particularly useful as an anti-float or anti-cratering agent in protective coatings.

Fluid SF-69 is non-corrosive to metals and other materials of construction; on long immersion, it may leach plasticizers from rubber compounds, causing them to harden and lose some weight and volume. The fluid is comparatively unreactive. However, it will further polymerize in the presence of catalytic amounts of strong acids, bases, or with metallic paint driers. Heat promotes this polymerization. Fluid SF-69 has excellent solubility in aliphatic and aromatic hydrocarbons, in chlorinated hydrocarbons, ethers, most common alcohols; it is insoluble in water and methyl alcohol.

Series SF-96 is a group of dimethyl silicone fluids, available in a range of viscosities. Some typical applications are as damping fluids in aircraft, automotive and electrical equipment; as dielectric fluids in electrical and electronic apparatus; as mold release agents in the rubber and plastics industries; as ingredients in waxes and polishes for furniture and automobiles; as the fluid in liquid springs; as ingredients in cosmetic and pharmaceutical preparations; as special high and low temperature lubricants; as heat transfer and hydraulic fluids; as foam control agents and as protective coatings.

In the last-named field, these fluids may be used as protective, beautifying and release coatings to many surfaces such as leather, rubber goods, plastic sheeting and molded articles, gaskets and the like. In compounded form they protect ordnance items in storage and sporting equipment in use.

Union Carbide Resins and Intermediates

Silicone products made by Union Carbide for use in compounding industrial coatings are as follows:

Resin R-64 is designed for cold-blending with alkyd, melamine, and acrylic type baking enamels to give them improved color and gloss retention, thermal stability, and resistance to weathering. Aluminum-pigmented R-64 (10-20%) alkyd blends possess all the high temperature (1200°F.) properties of straight silicones in aluminum paints, concurrently supplying important cost savings. Even though the alkyd will volatilize at 500°F., the silicone will have sufficient stability to hold the aluminum pigment in place until it fuses to the substrate. Inexpensive silicone-modified baking enamels can also be prepared that offer operating advantages at temperatures in the 300-500°F. range.

Resin XR-630 was developed specifically for use as a vehicle for white and colored high temperature enamel applications. It offers the combination of a low temperature cure, superior heat resistance, and low order of thermoplasticity (hot-tack). Paints and enamels based on Resin XR-630 offer greater heat, weather, and corrosion resistance than organic paints and are lighter in weight, more flexible, and less expensive than ceramic coatings. Resin XR-630 is employed in olive drab enamels intended for application to pipes and mufflers in military equipment where the temperature is in the range of 1200°-1500°F. In such applications it exhibits a relatively long craze life at intermediate temperatures (600-1000°F.), improved film flexibility and adhesion after heat aging, and improved resistance to water immersion of the air dried enamel.

This company manufactures four silicone *Intermediates* which can be reacted with a number of organic resins to form copolymers with a wide variety of properties. The intermediates have reactive ethoxy groups through which they can be reacted with alkyds, epoxies, isocyanates, phenolics, some sugar alcohols and a variety of polyols. With any of these organic resins, a careful selection of the silicone intermediate and its concentration can provide a copolymer with the desired properties. All of these reactions can be carried out in the standard equipment used for organic resin syntheses.

The intermediates are designated *XR-820, XR-822, XR-830,* and *A-183.* The latter is a monomer and the XR-800's are low molecular weight polymers, all having reactive ethoxy groups. They are marketed as pure liquid silicones with one exception. XR-830, having a very low ethoxy content, is extremely viscous, and is marketed as a 60 per cent solution in xylene to facilitate handling. These intermediates are readily soluble in a great many solvents including benzene, toluene, xylene, certain commercial petroleum distillates, chlorinated solvents, ether, ketones, Cellosolve solvents, and Carbitol solvents.

Three silicone varnishes produced by the company are as follows: *R-610* is a flexible varnish for Class H insulation components. *R-62* is a thermosetting product designed for use in Class H electrical insulation. Its principal uses are coating of glass cloth, bonding of inorganic insulation components and varnishing or coating of electric coils, armatures and stators in electric motors, generators and transformers.

R-620 is a thermosetting silicone designed specifically as an impregnating varnish for use in high temperature insulation systems such as Class H (AIEE) and Group III (NEMA Standards). Its principal uses are the varnishing or coating of electrical coils, armatures and stators, in electric motors, generators, and transformers intended for high temperature or heavy duty service.

Copolymer Formation

There are two ways to incorporate a silicone with an organic resin: *cold blending* (simple physical mixing which is popular in the paint industry) and *chemical reaction*. At the present state of technology the latter method appears to be the most successful way of making a silicone-organic copolymer for high temperature applications other than paint.

The properties of a particular silicone-organic copolymer depend, of course, on the nature and percentage of the organic portions as well as the type and amount of silicone intermediate. Considerable control of a product can be exacted by the selection of the appropriate silicone for copolymerization with any given organic resin or compound.

The initial work in copolymerizing organic resins was concentrated mainly on alkyds and phenolics. More recently attention has been directed upon modification of epoxy resins and polyisocyanates (polyurethanes).

There are two general techniques for carrying out a silicone-alkyd copolymerization. One involves the direct combination of the silicone and alkyd intermediates at high temperatures without the use of a solvent and is called "fusion cook." The other, termed a "solvent cook," is used to dissolve all reactants and to remove ethanol (or other solvents) by distillation. Fusion cooks have one disadvantage in that control of viscosity increase and end point cut-off before gelation is sometimes difficult to handle under commercial production conditions. For this reason, the solvent system seems to be more popular.

Epoxy resins hardened with a modified silicone intermediate can be used to advantage in most applications where 100 per cent epoxies are used. These include potting and encapsulating, protective coatings, and laminates. Silicone concentrations of 25-50 per cent markedly reduce oxidation on extended aging at temperatures as high as 200°C.

Silicone intermediates can also be condensed with A-stage phenolic resins (excess methylol groups). This reaction amounts to crosslinking the phenolic via silicone "blocks" and results in a copolymer with improved weatherability.

Formulating Protective Coatings with Silicones

The type of organic resin used in a silicone-modified coating will depend on the purpose of the coating. Some common organic resins used in silicone-modified coatings are listed in Table II.

Most silicone and silicone-modified coatings may be applied by spraying, brushing or dipping. In general, they show excellent adhesion to steel, aluminum, and magnesium, and fair adhesion to titanium and tin.

Silicone resins can be thinned with aromatic hydrocarbons, and with blends of aromatic and aliphatic hydrocarbons having kauri-butanol values greater than 50. They may also be thinned with most ketones, esters, and glycol ethers.

Thinners for silicone-modified resins will almost entirely depend on the properties of the organic constituent. For example, silicone-modified long oil alkyds can be thinned with mineral spirits, and silicone-modified epoxies can be thinned with blends of aromatic hydrocarbons and ketones.

TABLE II

Organic Resins Used in Silicone-Modified Coatings

Coating Application	*Organic Blending Resin*
aluminum coating	coumarone
	chlorinated diphenyl
	short oil alkyd
	ester gum
white enamel	acrylic
	nondrying alkyd
	triazine formaldehyde
colored enamel	phenolic
	low molecular weight epoxy
	medium oil alkyd
maintenance coating	various drying oils
	Parlon
lacquer	ethyl cellulose
	nitrocellulose
	½ sec butytrate
	acrylic
bodying agents	ethyl cellulose
	acrylic

Coatings based on silicone resins can be formulated in any color. The following general rules are followed in choosing pigments, dyes, and extenders for use in these coatings:

1. Only heat stable inorganic pigments and extenders should be used for high temperature coatings.
2. Chemical or weather resistant pigments, dyes, and extenders should be used in paints exposed to corrosive or inclement atmospheres.
3. Pigments should be free of lead and lead oxide, since they can act as resin catalysts and cause early film failure.
4. Where a colored transparent coating is desired, and where temperature conditions are not too severe, heat-stable dyes may be used. Fugitive dyes, which lose their color above a given temperature, are also available. Suitable dye concentrations average about one per cent.

The suitability of pigments, dyes, and extenders for silicone-modified coatings depends largely upon the organic constitutent of the resins. Standard pigments, dyes, and extenders used in organic maintenance, trim, and baking enamels can also be used in similar silicone-modified coatings intended for similar conditions of service.

In contrast to white and color pigmentation, aluminum should be incorporated in relatively high quantities for best results. Whereas, one and three-quarters to two pounds of paste per gallon of vehicle is used in high grade conventional paints, two and one-half or three pounds is in order for silicone aluminum paints intended for temperature exposure in the range of 1000°F. The reason for the high pigmentation is that in such temperature ranges aluminum provides the barrier between the substrate to be protected and the

corrosive atmosphere. Even silicones have their limitations at high temperatures. Fortunately, they do not oxidize and crumble, thus destroying the film, but they do volatilize slowly, leaving a metallic aluminum coating firmly fused to the steel. It has been observed that the coarse types of aluminum flake have generally given consistently good results. The normal 325 mesh grades are usually good for this service also. The general field of application does not seem to warrant the extra fine lining grades.

Zinc dust may be used in place of aluminum to form durable heat resistant paints. Since zinc is quite reactive it is suggested that, in order to avoid any "gassing" problems, such paints be packaged in two compartment containers.

Coatings based on silicone resins will heat cure without driers. Where lower curing temperatures are desired, metallic driers may be added. Zinc and cobalt octoates (at concentrations of 0.05 to 0.2 per cent metal) have been found suitable.

Other metallic driers such as lead, calcium, potassium, titanium, and tin tend to reduce the heat resistance of silicone coatings. Iron driers reduce the shelf life of the formulation. Naphthenate driers are effective, but discolor the silicone resin.

Driers for silicone-modified resins should be selected according to the organic constituent. Cobalt, manganese and calcium driers can be used in formulations containing drying oils. Formulations using lead driers should be checked carefully for package stability. The following drier combinations have been found effective in the most common types of silicone-modified resins:

Type of Resin	*Drier Combination*
silicone-alkyd	0.06% Co, 0.03% Mn, 0.5% Ca
silicone-phenolic	0.05% Co, 0.3% Pb
silicone-epoxy	0.05% Co

Physiological Properties of Silicones

A detailed study of the physiological data on silicones has been conducted by General Electric. In summary, a number of investigators found that silicone fluids produce no toxic manifestations, either internally or externally, and are essentially harmless. However, fluid or vapor in the eyes will cause a transitory irritation that disappears after a night's sleep. No corneal damage has been observed and ordinary cleanliness, especially respecting the hands and eyes, prevents discomfort.

Perspective

As indicated earlier, it may be said that paints and enamels formulated from silicone resins span the gap between vitreous enamels and organic protective coatings. In addition to the various firms that carry forward research in the field of silicones, several branches of the U.S. Government are likewise engaged in similar research activities. Two reports on these research activities put into proper perspective the comparison of silicones with other similar materials. The first of these, a 1957 report published by the Office of Technical Services of the Department of Commerce entitled "Heat and Abrasion Resistant Paints for Rocket Launchers" compared thirteen coatings for resistance to deterioration by heat from a blast flame and abrasion by sand. It concluded that "ceramic" type coatings which can be applied with standard paint spray equipment appear to be superior to either silicone or dibutyl titanate type coatings. Teflon coatings were also found to be resistant to heat and abrasion, but these coatings are probably more difficult to apply . . ."

An earlier report by the same agency entitled "Fire Retardant Coatings" stated that "silicones offer good possibilities as a binder and a vehicle for a foaming type of coating . . . When heated, these resins soften and, as the temperature increases, the resin decomposes forming a hard silica residue that has a marked solidifying effect on the foamed coating. These resins have the disadvantage of shrinking, and causing cracks to develop in the coating. This characteristic can be controlled by a thermoplastic filler. The flammability of the resins is another serious drawback . . . The only method of effectively controlling flammability has been to apply a non-flammable top coat."

Thus we may conclude that silicone resins, like other synthetic resins, have a definite niche in the field of polymers for use in organic coatings. Each type of resin can serve a specific purpose, as we will see, for example, in the case of melamine resins to be discussed in next month's article in this series.

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Literature supplied through the courtesy of Dow Corning Corp., General Electric-Silicone Products Dept., and Union Carbide Corp., Silicones Division.

FINISHING POINTERS

(*Continued from page* 91)

of other properties such as buffability or hardness may be in order before final limits are set. Testing of the bath and the properties of the deposit can result in a final bath that will no longer be recognized as a modified high pH Watts type bath.

Chemical concentrations alone do not establish limits. Time can be very important in a processing bath such as a strike bath. For instance, it has been recommended that a silver bath for striking steel be controlled to 1 to 1½ g./l. AgCN at two minutes or at 2 to 3 g./l. AgCN at one minute striking time.[4] Properties of the deposit, such as porosity, roughness, or hardness, may impose limitations, particularly if the deposits are heavy. Moreover, if one is exploring the unknown it is best to start with a standard bath and defined limits.

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SHOP PROBLEMS

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Increasing Texture of Textured Vinyl Coatings

Question: Occasionally we experience too flat a surface on our textured vinyl coatings. Our cycle consists of: alkaline cleaning, cold water rinsing, dilute acid dipping, activator dip, phosphate dip, cold water rinsing, chromic acid seal, cold water rinsing, compressed air blow-off drying, sprayed vinyl primer, sprayed vinyl finish, and sprayed texturing agent. We have tried to increase the size of the texturing by using more texturing agent; however, the texture then takes on an unattractive "watery" appearance. How can we increase our texturing consistently so that we can be assured of always obtaining the excellent finish we require?

H. J. L.

Answer: The function of the texturing agent is to swell the wet vinyl coating into small irregularly shaped flat hemispheres. Normally the height of these hemispheres is dependent upon the quantity of wet vinyl material available for swelling and to a lesser extent upon the texturing agent droplets.

Experience has therefore shown that in order to increase the surface texture one should apply a heavier coating of vinyl finish. Personal preference will dictate which thickness should be applied. Many feel that the range 0.006 to 0.009 inch dry film thickness is desirable. The dry film thickness, which can easily be measured by peeling the vinyl film from a metal coupon which has not been primed and using a micrometer, will be a measurement from the smooth base to crests of the textured surface.

Chromium Plating Aluminum

Question: Under Shop Problems, in the February issue of METAL FINISHING, you list a German process (FKl method) for hard chrome plating on aluminum. Could you furnish us further information on:

1) what method of cleaning is employed and would it apply to any alloy

2) is this a German patent, and if so have they applied in this country — do you have the numbers

3) if there is no patent, could you furnish the names of the companies in Germany or this country that are using this method.

Any other information regarding the subject matter will be appreciated.

H. M. B.

Answer: The information on the FKI chromium plating process for aluminum was obtained from an article by P. Coskan in Metalloberflache, **13,** 81, 113 (1959). The article does not go into detail as to the method of cleaning, but the usual degreasing and alakline cleaning methods are probably employed.

We are not aware of any patent on the process and doubt if any patent could be obtained, in view of the disclosure back in 1942 of a similar method by Keskulla & Edwards, who used a mixture of 3 volumes nitric acid and 1 volume hydrofluoric acid, prior to nickel plating.

Embrittlement of High-Carbon Steel

Question: I work in a job plating shop where we are required to nickel and gold plate high carbon steel clips that are eventually put on pen caps. We feel that the best material to use in the making of these clips would be phosphor bronze. However, due to a difference in price of materials, our customers continue using this high carbon steel.

Before these clips come to us for plating, they are given to a heat-treater for hardening. We have now been informed by our customer of hydrogen embrittlement in these steel clips. My question is this — who is responsible for the condition of hydrogen embrittlement, the heat-treater or the plater? Any information you can give me would be very much appreciated.

A. C.

Answer: Without studying the finishing operations, it is not possible to place the blame on either the plater or the heat treater. The plater must be sure to use an acid dip of the shortest duration, and avoid direct current cleaning. The acid dip is the serious offender, while the nickel plating operation itself is usually a minor cause of embrittlement.

Usually, pen clips are barrel tumbled prior to barrel plating. If the heat treater hardens and tempers the steel with a bright finish, only a quick acid dip is needed prior to plating. However, hydrogen embrittlement cannot be eliminated entirely and use of phosphor bronze, spring brass, or steel with a lower carbon content and less hard should be used, if possible. Baking for embrittlement relief is generally unsatisfactory.

Rhodium Plating

Question: We have been rhodium plating jewelry for several years, and have been asked to plate some electronic parts. We would like you to answer some questions for us.

1. How do you rhodium plate the inside of a long, narrow tube such as ⅜" x 9" long?

2. What is the best way to determine the thickness of such a plate.

3. What is meant by reverse plating as applied to silver plating.

4. What would be a good cleaning method for electronic parts prior to rhodium plating.

G H.

Answer: To rhodium plate the ininside of a long, narrow tube you should use a platinum wire as the anode.

There is no simple way to determine the amount of rhodium deposit. If the deposit is sufficiently thick, the part can be weighed on an analytical bal-

ance before and after plating. The difference between the two figures being the weight of the rhodium deposited.

You are probably referring to "periodic reverse" plating. In this procedure, the current is reversed for a short period, at regular intervals, so that the plating cycle is 15 seconds direct current, for example, and 3 seconds reverse. During the deplating period, the surface is smoothed out so that more uniform deposits can be obtained at higher current densities.

Standard cleaning methods are used prior to rhodium plating, depending on the metal cleaned. Suppliers can furnish suitable materials.

Drying Lapped Joints

Question: We are nickel plating steel parts that consist of two angle irons that are 10" long and are spot welded together at four spots.

The difficulty that we are having is the seepage of solution that occurs a day or two after the parts are delivered. The parts are rinsed after nickel plating in cold water then in soap and then in hot water 180 degrees.

Could you suggest any other drying method whereby we could eliminate this seepage which causes corrosion along the lips of the parts?

H. G. S.

Answer: To minimize seepage from lapped joints, we would suggest that you use an air blast nozzle and blow out the joints. Other possible methods are:

1. Baking at about 250°F. after the hot water rinse.

2. Use of a rinse aid in the hot water rinse.

3. Water-displacing liquid, followed by vapor degreasing.

Dissolving Rhodium

Question: Please inform us as to how rhodium sponge can be dissolved and made up to a sulphate solution, as we have a few ounces on hand and would appreciate the above information.

M. N.

Answer: Finely divided rhodium metal can be fused with potassium bisulfate. The resulting melt is dissolved in water and heated to about 175°F. Sodium hydroxide is added to precipitate the metal as rhodium hydroxide.

The rhodium hydroxide is filtered and washed thoroughly, then dissolved in sulfuric acid.

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Science for Electroplaters

58. Adhesion

By L. Serota

This is the second half of Part LVIII. The first half appeared in the June issue.—*Ed.*

Nature of Adhesion

Ferguson and Stephen associate adhesion in electrodeposits with such commonly named forces as gravitational, magnetic, electrical, adhesive, cohesion van der Waal's, chemical valence, covalence, atomic, and related factors. Such forces, it is suggested, can in turn be combined under the electrical and magnetic forces within the atom. I. Langmuir contends that such forces should not be distinguished as physical and chemical forces but, instead, as interatomic and intermolecular forces, both chemical in nature. Adsorption, for example, is shown experimentally frequently to be the result of chemical union between the atoms of the adsorbed substance and the atoms of the solid.

The surface of a solid (or crystal) is represented as a pattern of atoms arranged in a plane lattice formation, with the space between and above the surface of these atoms exhibiting a stronger electromagnetic field than that between the atoms within the solid (crystal).

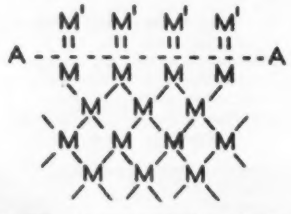

Fig. 225. Forces involved in adhesion.

The effect of such forces, involving adhesion, is shown graphically by Ferguson in Fig. 225. The dotted line AA represents a clean surface of a basis metal. The forces (represented by lines) for the atoms within the body are satisfied. The forces for the surface atoms, however, although of the same type, are not satisfied and are accordingly quite active. The double lines, at right angles to the surface AA, represent the active surface forces or connecting forces between M, the basis metal, and M′ the atoms of an electrodeposited metal or an adsorbed substance which could result from improper cleaning, or by adsorption of some material somewhere between the cleaning cycle and the actual start of plating.

The strength of this force will vary with the distance between the substances, with the greatest force existing at interatomic distances. As the distance apart increases, the (force) strength decreases and is reduced almost to zero when the distance is only a few molecular diameters. Such surface forces are highly selective. An example is the anodic treatment of aluminum, prior to electrodeposition of another metal, for producing a good bond.

Hothersall ascribes electrodeposition of a metal on a chemically clean metallic surface to one of three possible atomic arrangements. For the first of the suggested order, a continuation of the crystal lattice of the basis metal may result with the structure duplicated in the deposited metal. Hothersall considers this type a case of perfect adhesion. Ferguson refers to this type of bond, where the atoms of the electrodeposited metal continue the same crystal exhibited by the basis metal, as the strongest possible bond. In support of this view a photomicrosection, obtained by Hothersall, of nickel deposited upon a previous electrodeposit of nickel is shown in Fig. 226. The surface was filed smooth. Continuation of grain growth at the line of junction is clearly indicated in the photograph.

The investigation by Hothersall included the possibility of a continuation of the microstructure of several basis metals (nickel, iron, tin, copper) upon

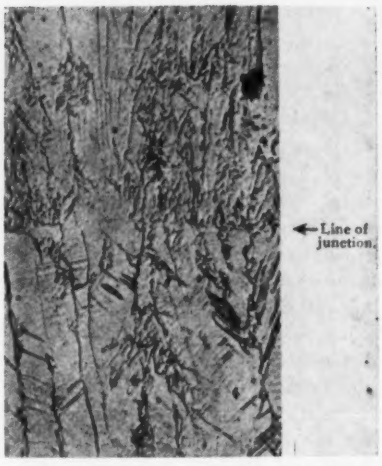

Fig. 226. Microsection of nickel electrodeposited on previous nickel deposit showing grain growth across junction. X300.

dissimilar electrodeposited metals. Such plated metals differed from the basis metal either in crystal form in lattice constant, or in having a distorted lattice. The following conclusions were indicated: a continuation of the basis metal structure is possible when the deposit and basis metal belong to the same crystal system over a range of differences, in lattice parameter (—2.4 to + 12.5%), or when deposit and basis metal belong to different systems. For example, tin (tetragonal) continued the microstructure of copper, and copper that of (beta) brass. With electrodeposited nickel, although similar results were obtained with nickel deposited upon nickel (Fig. 226), and evidence of such relationship was also obtained for nickel deposited on annealed iron, Hothersall did not find electrodeposited nickel entirely satisfactory, because the interference (as colloidal hydroxide) with crystal growth is sufficient to prevent formation of coarse-grained deposits. P. A. Jacquet reports that some hydrophilic colloids such as proteins, and the disintegration products forming adsorption films on metal surfaces (Cu, Ni, Fe, Pt), appreciably affect the adhesion of the deposit to these metal surfaces.

The view thus expressed by the author, based upon his results and those of other investigators, is that an appreciable degree of distortion or change in the growing lattice of the deposit by inclusion, in solid solution or combination, of foreign elements, should be possible without pronounced interference with crystal growth. He adds further that adhesion of electro-

deposited coatings may be due, in some instances, to a continuation of the crystal lattice of the metal vapors which are deposited, even though the thickness of the deposit is so small that it may not be visible in the microstructure.

The influence of the basis metal upon the structure of the deposited metal was first noted by A. K. Huntington. He reported a continuation of the crystal form and orientation of the copper basis metal in the microstructure of copper electrodeposited upon it. W. Blum and H. S. Rawdon showed experimentally that some of the copper deposit crystals were continuations of the crystals in the copper basis metal. When copper was deposited electrolytically upon cast or rolled copper, which was previously cleaned with alkali and then treated with nitric acid, the deposited copper showed the crystal form and orientation of the basis metal, Fig. 227. The area marked w in the photograph represents the basis metal; x denotes the electrodeposited copper; y is the electrodeposited nickel; z indicates a second layer of deposited copper. The line of junction between the basis metal w and the deposited copper z is noticeable.

It is interesting to note that, in 1916, G. B. Hogaboom referred to the effect that the structure of the basis metal, especially steel and German silver, has upon the character of the metal deposited upon it. Mention was made then of the coarse crystalline nature of the deposit of silver on articles made from 18 per cent nickel silver, a difficulty traced to the structure of the basis metal. In 1921 Hogaboom pointed out a similar continuation of structure of basis metal in a photomicrograph shown by Blum. Reproduction of the rolled copper base was evident in the electrodeposit. Two years later Blum and Rawdon confirmed this observation by Hogaboom in the photomicrograph shown in Fig. 227.

A. K. Graham also reported reproduction of the crystal structure of the basis metal in the electrodeposited metal in such cases as copper on copper and copper deposits on nickel, but was uncertain with deposits of nickel on annealed nickel. Graham contends, however, that the nitric acid cleaning step (dip) prior to plating, indicated by Blum and Rawdon as necessary, is not essential for obtaining reproduction. He emphasized the fact that the important condition is a clean metal surface, and expressed the view that reproduction is not basically a function of preliminary chemical treatment but of the state of the metallic surface.

G. I. Finch and C. H. Sun, in their measurement, by the electron diffraction method, of the extent of influence of the substrate on the crystal orientation in the deposit, found that the effect could be detected up to a thickness of about 1000 Å. The substrate influence, they found, was pronounced with nickel, but varied. It was greatest for gold, with the substrate effect lost with a nickel deposit of 2000 Å. The effect decreases as the metal varies from tin to alpha brass. With copper and nickel deposits, on iron, the substrate orientating influence could not be detected. At a thickness of only about 50 Å orientation was observed. Where orientation on the crystals in the deposit was not effected, poor adhesion resulted. R.A.E. Hammond states that continuation of crystal structure can be attained for different pairs of metals if the crystal form and interatomic spacings are not too dissimilar. A lattice constant difference of 15 per cent would be permissible for such pairs of metals. Beyond a thickness of 1000 Å (the lattice dimensions of the interface) the spacing of the atoms of the deposited metal would be normal.

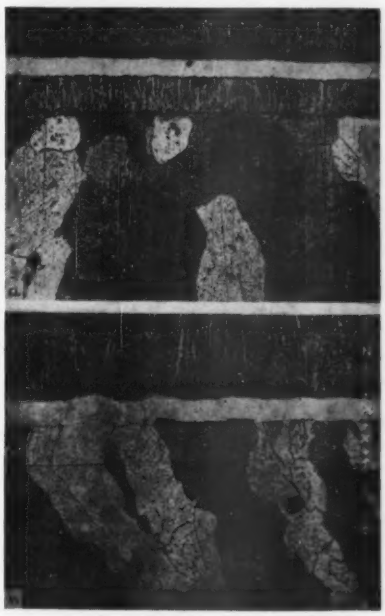

Fig. 227. Section of the chilled side of a "pig" of cast copper, upon which copper was electrolytically deposited. X100. a. The surface was cleaned but not pickled, prior to the electrodeposition; b. The surface was pickled after cleaning. The various zones indicated in "b" are the same throughout all of the micrographs; w, base metal; x, electrodeposited copper (first layer); y, electrodeposited nickel; z, electrodeposited copper (second layer).

Cohesion

For the second possible atomic arrangement of electrodeposited metals, suggested by Hothersall, the discharged ions would form on the surface of the basis metal sufficiently close to be within the field of molecular attraction, representing a cohesive force between the two metals. G. E. Gardam states that, based upon experimental observations of investigators, it may be concluded that discharge of ions on a metal surface requires lateral movement, such force appearing as polarization.

E. A. Ollard, in his study of adhesive forces, expresses the view, based upon microscopic examination of test specimens of nickel deposited upon pickled steel (Ollard test), that adhesion may be due to the cohesive force between the crystals of the two metals. Whether such cohesion is the result of molecular attraction, intermingling of the space latices, or an inter-crystalline cement, Ollard does not attempt to decide. R. A. F. Hammond refers to the bond or metallic unit, when a continuation of the crystal structure of the basis metal is attained, as one which is determined by the interatomic forces — atomic adhesion.

C. H. Desch indicates that, since the cohesive forces in layers of atoms nearest the surface are attracted from below but not from above (unsymmetrical), it may be assumed that crystals possess a surface layer of lower density than normal. Desch adds further that there is no important theoretical distinction between cohesion and adhesion, it being most probable that the differences may be attributed to differences merely in intensity of the forces involved. Continuation of crystal growth for two similar metals, such as is shown in Fig. 227, is cited as an indication that cohesion and adhesion are fundamentally the same.

Although electrolytic deposition of a metal on another metal, at ordinary temperatures, will not cause interpenetration, diffusion may result upon heating, Desch states. This process of diffusion for two metals in contact may occur in both directions as, for example, nickel diffusing into copper and copper into nickel. The hardening of a metal (increased cohesion) is at-

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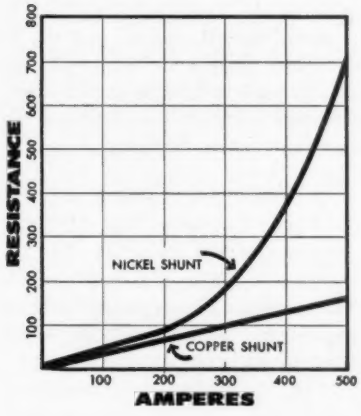

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tributed to the diffusion of the second (coated) element into the metal.

R. J. McKay observed a rosy color appearing on nickel cathodes when the current was shut off, a condition he attributed to the cementation of a slight amount of copper out of the solution. Removal and storing of such cathodes for several months resulted in the color vanishing. This effect is ascribed to the diffusion of the copper into the nickel. The rate is slow, but with a thick deposit the color remains. A copper deposit on nickel, McKay indicates, will diffuse rapidly at a cherry red temperature or at low red heat.

W. C. Traub found, in his investigation of the diffusion of electrodeposits into zinc, that copper, brass, gold, and silver diffuse into zinc, but not into nickel. W. F. Castell found that the diffusion of electrodeposited copper on zinc will be quite rapid at a temperature range of 220°-450°F. (105°-232°C.) but that very little copper could be found alloyed with zinc when the copper plated zinc was kept at normal temperatures. This is shown effectively by the photomicrographs obtained by Castell. In Fig. 228, a cross section from a horn projector, the diffusion of copper into zinc at atmospheric temperatures is very slight after a period of 18 months. Fig. 229a is a photomicrograph of a zinc die cast plated with 0.00007" copper followed by a deposit of nickel. When the specimen shown in Fig. 229a was heated to 450°F. for 48 hours, the copper diffused into two layers (Fig. 229b). The extent of the diffusion zone, about 6 times the thickness of the initial copper deposit, is evident by a comparison of 229a and 229b before and after the heating step.

Diffusion or alloy formation, as Traub indicates, represents the third form of atomic arrangement suggested by Hothersall, wherein the discharged ions occupy positions within the lattice of the basis metal. This initial alloy layer of atomic dimensions, Hothersall adds, may, by diffusion, increase in thickness. The existence, however, of a compound or alloy layer between the deposited coating and the basis metal (with the exception of some coatings such as copper on zinc, where interdiffusion may occur) is not supported, he contends, by microscopic or x-ray examination. E. A. Ollard also questions the probability of interpenetration and alloying taking place when a metal is electrodeposited upon another metal from an aqueous solution. Should such interpenetration occur, the extent would be infinitesimal and not likely to account for the forces required for good adhesion.

H. E. Boyer, on the other hand, writes that an electrodeposited metal is alloyed with the basis metal, and attributes peeling or flaking of the plate to poor alloying. The alloyed layer is too thin for measurement by metallurgical microscopes, but advanced scientific instruments, Boyer states, indicate that this layer is thicker than that considered likely heretofore. One of the methods of alloying is described as intersticing or dissolution of one metal in the others, the result of some atoms entering the space between the atoms composing a lattice. A second method of alloying is described as (surface) alloying by exchange, in which atoms from a lattice leave and are replaced by atoms of the new metal.

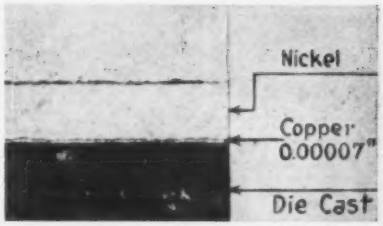

Fig. 229a. Sample No. 1 — Die cast with copper deposit approximately 0.00007 in. (0.0018 mm.) thick. X500

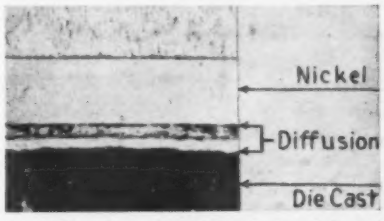

Fig. 229b. A section of sample No. 1 heated at 450°F. (232°C.) for 48 hours. All copper is diffused and two distinct diffusion layers are noticeable. The diffusion zone is approximately six times thicker than the original copper deposit. X500

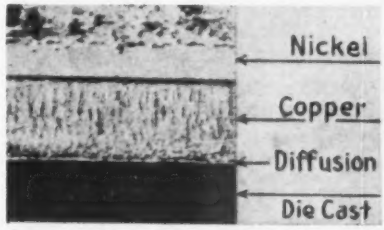

Fig. 228. Diffusion of copper into the zinc at atmospheric temperatures is very slight even after 18 months. X500

Patents

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Hot Dipping Wire

U. S. Patent 2,914,423. *Nov.* 24, 1959. *E. L. Knapp, assignor to Armco Steel Corp.*

A coating apparatus for coating a metal strand with molten coating metal.

Pickling Solution

U. S. Patent 2,916,458. *Dec.* 8, 1959. *B. L. McFarland, assignor to Aerojet-General Corp.*

A pickling solution consisting essentially of an aqueous solution of hydrofluoric acid in an amount of from about 50% by volume of the total volume of the solution and from about 10% to about 35% nitric acid by volume of the total volume of the solution.

Hot Dip Aluminum Coating

U. S. Patent 2,917,818. *Dec.* 22, 1959. *R. F. Thomson, assignor to General Motors Corp.*

A method of providing a ductile, oxidation-resistant coating on a ferrous metal article, comprising electroplating a layer of chromium having a thickness of approximately 0.00025 inch to 0.001 inch on a ferrous metal article, thereafter immersing said chromium plated ferrous metal article in a fused salt bath heated to a temperature of about 1280°F. to 1400°F. and activated by aluminum in contact therewith to flux said article, retaining said plated article in said salt bath until the surface temperature of said article substantially reaches the temperature of said bath to partially diffuse the chromium into the ferrous metal and to dissolve oxides of chromium in the salt, subsequently immersing said plated article in a molten coating metal selected from the class consisting of aluminum and aluminum base alloys heated to a temperature of about 1250° F. to 1325°F. and retaining said article in said molten coating metal for a period of time not exceeding ten seconds to thereby form on said article a ductile aluminum-iron-chromium interlayer having a thickness of approximately 0.0005 inch to 0.002 inch and an aluminum overlay having a thickness between about 0.0005 inch and 0.004 inch.

Etching Aluminum

U. S. Patent 2,918,357. *Dec.* 22, 1959. *R. H. Elliott, Jr., assignor to Pennsalt Chemicals Corp.*

The method of increasing the rate of etch of a magnesium-rich aluminum alloy by an alkaline etching solution comprising including stannous tin in the solution.

Hot Dip Aluminum Process

U. S. Patent 2,918,388. *Dec.* 22, 1959. *G. A. Moller, assignor to American Mollerizing Corp.*

A process for continuously coating base metals with a coating metal selected from the group consisting of aluminum and aluminum alloys, which comprises the steps of: immersing the base metal to be coated in a preheating molten salt bath having a temperature of between 1000°F. and 1650°F., said base metal being immersed in said salt bath without previously contacting said coating metal, said salt bath comprising at least one halide salt; withdrawing said pretreated base metal, after it has reached substantially the temperature of said salt bath, directly into a molten coating metal layer, overlying a portion of said salt bath, without intervening oxidation; and withdrawing said coated base metal immediately from said coating metal.

Corrosion Prevention of Zinc

U. S. Patent 2,918,390. *Dec.* 22, 1959. *L. J. Brown and S. Spring, assignors to Pennsalt Chemicals Corp.*

The method of preventing white rust on galvanized stock comprising cathodically cleaning the stock in alkali, rinsing off the entrained alkali, applying a 0.01 to 1% solution of a fatty amine salt thereby depositing a hydrophobic fatty amine salt layer on the bare metal, and then applying a 0.05 to 0.5% solution of a hexavalent chromium compound directly to said fatty amine salt layer, said salt having the formula $R\text{-}NH_3X$ wherein R is an alkyl group having at least 8 carbon atoms and X is an anion of the group consisting of acetate, lactate and chloride.

Gas Plating Porous Bodies

U. S. Patent 2,918,392. *Dec.* 22, 1959. *H. Beller, assignor to General Aniline & Film Corp.*

The process of depositing metal in the pores of the porous body comprising the steps in combination of impregnating said body with liquid metal carbonyl whereby liquid metal carbonyl is introduced into the pores, and the liquid is held therein and in liquid condition by surface tension and capillary forces and thermally decomposing the carbonyl in situ by heating.

Antimony Plating

U. S. Patent 2,918,414. *Dec.* 22, 1959. *G. R. Schaer, assignor to Bradley Mining Co.*

The process of preparing a steel object to receive an electrodeposited coating of antimony comprising: preceding the application of said antimony on said steel object by treating said steel anodically in an acid solution at a current density of at least about 75 amperes per square foot for a sufficient length of time to cause passivation at said anodic object with consequent liberation of gas therefrom, the physical condition of the surface of said object not being disturbed thereby; said acid being selected from the group consisting of sulfuric acid, phosphoric acid, and hydrochloric acid.

Antimony Plating

U. S. Patent 2,918,415. *Dec.* 22, 1959. *G. R. Schaer, assignor to Bradley Mining Co.*

The process of electrodepositing a continuous spot-free antimony coating on steel from a weak acid solution by first plating in an aqueous iron plating bath at a temperature of about 140°F., consisting of ferrous sulfate 300 g./l., ferrous chloride 42 g./l., boric acid 30 g./l., sodium formate 15 g./l., ammonium sulfate 15 g./l., sodium lauryl sulfate 1 g./l., and the balance water, at pH of from about 4.0

to 4.2, then electroplating antimony on said steel in a weak citric acid plating bath comprising potassium citrate 145 g./l., citric acid 185 g./l., antimony oxide 50 g./l., and the balance water, said bath having a pH of from about 3.5 to 3.7.

Hard Anodizing Aluminum

U. S. Patent 2,918,416. *Dec.* 22, 1959. *P. H. Taylor*

In a process for the production of an oxide coating on an aluminum surface, the step comprising subjecting said surface to electrolytic oxidation in an electrolyte consisting essentially of an aqueous solution of mellitic acid and an acid selected from the group consisting of sulfuric acid, chromic acid, phosphoric acid, oxalic acid and mixtures thereof.

Centrifugal Blasting Machine

U. S. Patent 2,918,758. *Dec.* 29, 1959. *K. H. Barnes, assignor to Wheelabrator Corp.*

A cleaning machine of the type described.

Parts Washer

U. S. Patent 2,918,926. *Dec.* 29, 1959. *G. W. Behnke and R. G. Westcott, assignors to Simplicity Engineering Co.*

Parts washing apparatus comprising a main frame; a tank supported by said main frame and normally containing a washing liquid; a parts receiving basket having perforate bottom and side walls and an open end; means mounting said basket for oscillation and within said tank so that parts in said basket may be immersed in said liquid; and oscillating means comprising a pair of eccentric masses; means journalling said masses for rotation about spaced axes so that at predetermined points in their rotation said masses alternately will oppose and complement one another.

Plating Process

U. S. Patent 2,919,233. *Dec.* 29, 1959. *G. C. Cox*

The process of electrolytically depositing an amphoteric metal, selected from the group consisting of lead, tin and zinc, on a ferrous metal structure which comprises coating said structure with a firmly adherent amphoteric coating complex of low solubility containing the metal to be deposited, and then subjecting said coated structure to a cathodic current density of sufficient magnitude in an electrolyte containing a soluble alkali metal salt which will liberate a hydroxide of the alkali metal at the cathode thereby solubilizing the amphoteric metal component of the amphoteric coating complex at the cathode interface while at the same time electrodepositing on the cathode the selected amphoteric metal from the solubilized product.

Dip Coating

U. S. Patent 2,919,208. *Dec.* 29, 1959. *L. G. Treat, assignor to The Dow Chemical Co.*

A method of coating a straight metal object having a greater length than girth and of uniform cross section from end to end with a pigmented liquid coating material.

Anodizing Process

U. S. Patent 2,920,018. *Jan.* 5, 1960. *M. A. Miller, assignor to Electro-Chem Mfg. Co., Inc.*

An anodizing method for forming a relatively thick and hard inorganic corrosion-resistant non-reactive anodic film on an electrically conductive body capable of being anodized which includes: providing an electrolyte having a tendency to dissolve the anodic oxide film on the electrically conductive body, the rate of which dissolution increases with increase in the temperature of the electrolyte at the surface of the body, immersing at least a portion of the electrically conductive body in the electrolyte, and passing a series of uni-directional electrical current pulses of a repetition frequency of about 60 pulses per second through the electrolyte and through the electrically conductive body to provide an anodic oxide film on the electrically conductive body, with each successive pulse penetrating the oxide film to the electrically conductive body and with each of said unidirectional current pulses being separated by an interval of essentially zero current flow through the electrolyte and through the electrically conductive body, with the interval between each of such current pulses being of a duration approximately three times the duration of the interval of each of the current pulses to provide a cooling period at the surface of the immersed portion of the electrically conductive body between each of said current pulses, the cooling period between each current pulse being approximately three times the duration of each current pulse.

Corrosion Prevention — Black Plate

U. S. Patent 2,920,019. *Jan.* 5, 1960. *E. J. Smith and J. R. Smith, assignors to National Steel Corp.*

A method of improving the corrosion resistance of black plate which comprises the step of anodically treating the black plate in an aqueous acidic bath consisting essentially of at least one phosphate selected from the group consisting of sodium dihydrogen phosphate and potassium dihydrogen phosphate, the amount of dihydrogen phosphate in the bath being from 1 to 15 ounces per gallon of solution when calculated as sodium dihydrogen phosphate monohydrate.

Fused Bath Cleaning

U. S. Patent 2,920,023. *Jan.* 5, 1960. *C. D'Aquila and R. E. Bohne, Jr., assignors to Chrysler Corp.*

A composition for a molten electrolytic ferrous metal cleaning bath comprising caustic alkali selected from the group consisting of sodium hydroxide and potassium hydroxide and mixtures thereof and alkali fluoborate salt selected from the group consisting of sodium fluoborate and potassium fluoborate and mixtures thereof, said alkali fluoborate salt being present in the proportion of about three parts by weight thereof to about 97 parts by weight of the caustic alkali.

Coating Thickness Gage

U. S. Patent 2,920,269. *Jan.* 5, 1960. *E. A. Hanysz, C. E. Quinn and E. F. Weller, Jr., assignors to General Motors Corp.*

An oscillator having a tunable input and a tunable output circuit, and reactance probing means adapted to be moved into juxtaposition with a part to be tested which is electrically connected to one of the tunable oscillator circuits to change the load on the oscillator.

Finger Buff

U. S. Patent 2,920,428. *Jan.* 12, 1960. *E. W. Hall and A. S. Rock, assignors to F. L. & J. C. Codman Co.*

A rotary buff section comprising a center and a multiplicity of independent fingers extending therefrom in two

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Electrostatic Coating

U. S. Patent 2,920,982. *Jan.* 12, 1960. *E. P. Miller, assignor to Ransburg Electro-Coating Corp.*

The method of producing an extremely thin coating on an article which comprises depositing droplets of a liquid having a dielectric constant of at least 2.0 and a resistivity of the order of at least 10^{12} ohms per centimeter cube in spaced relationship on the article, creating an electrostatic field over the surface of the article carrying the droplets to maintain on the exposed surfaces of the droplets an electric charge, and maintaining the charged droplets in said field until they have been flattened by said charge and thereby coalesced into a continuous film over said article surface, said droplets being deposited in number insufficient to coalesce and form a continuous film in the absence of said field.

Barrel Plating Cylinder

U. S. Patent 2,921,009. *Jan.* 12, 1960. *C. W. Jenks and J. B. Niles, assignors to The Stutz Co.*

An improvement in a mounting for a material treating and plating apparatus which has a barrel rotatably suspended between a pair of oppositely disposed guide arms depending from a hanger bar with each of said arms having an elongated slot formed therein.

Gas Plating — Aluminum

U. S. Patent 2,921,868. *Jan.* 19, 1960. *C. Berger, assignor to Union Carbide Corp.*

In a method of gas plating materials with aluminum metal, the improvement which comprises the steps of arranging the materials to be plated in an enclosure, removing the air from said enclosure and replacing the same with inert gas pre-washed with liquid hydrocarbon the improvement which comprises, introducing a gaseous aluminum organo compound into said enclosure and in contact with the material to be plated with aluminum, and heating the enclosure and material re-

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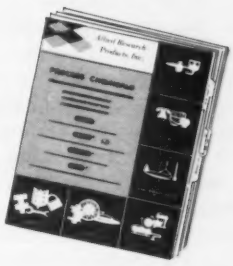

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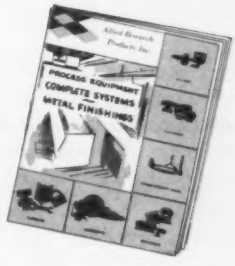

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tained therein to a temperature sufficient to cause thermal decomposition of said gaseous aluminum compound and deposition of aluminum metal onto said material.

Gas Plating — Chromium

U. S. Patent 2,921,877. *Jan.* 19, 1960.
G. A. Samuel and J. V. Bell, assignors to David Craven

The process of chromizing air hardening tool steels, which comprises placing in a metallic retort, air hardening tool steel parts of the class consisting of AISI D1, D2, D3, D4, D5, D6, 440C, A2, A4, A5, A6, M1, M2, M3, M4, M6, M8, M10, M30, M34, M35, and M36, along with a source of granular metallic chromium and a halogen chromizing catalyst, closing the retort to the atmosphere, heating up the retort and its contents to a hardening temperature for said steel in the range between 1600 and 2400 degrees F. and holding said parts at such temperature for at least thirty minutes, and then quenching the retort and its contents in a liquid cooling medium.

Plating on Titanium

U. S. Patent 2,921,888. *Jan.* 19, 1960.
D. Halpert, assignor to Vertol Aircraft Corp.

The process of electrodepositing metal selected from the group consisting of nickel, cobalt and alloys of nickel and cobalt on titanium and titanium base alloy members which consists of immersing the titanium member in a solution of hydrofluoric acid for a time sufficient to form a violet film, rinsing said titanium member in water and then immersing the member in an aqueous electrolyte consisting of at least one sulfate salt selected from the group consisting of nickel sulfate and cobalt sulfate, the nickel sulfate in an amount corresponding to from 70 to 375 grams of nickel sulfate ($NiSO_4 \cdot 6H_2O$) per liter of solution, the cobalt sulfate in an amount corresponding to from 70 to 375 grams of cobalt sulfate ($CoSO_4 \cdot 7H_2O$) per liter of solution, and sulfuric acid in quantity sufficient to adjust the solution pH value from about 0 to 6.2, said bath being substantially free of metal salts of halogen acids, and then passing a plating current through the member at a current density of 5 to 100 A.S.F., thereby depositing on the titanium member a metal coating which remains firmly adherent at a temperature of 1000°F.

Strip Treatment Roll

U. S. Patent 2,921,893. *Jan.* 19, 1960.
E. J. Smith, assignor to National Steel Corp.

In electrolytic apparatus of the class wherein metal strip is guided through a body of liquid containing at least one salt by a series of suitably arranged rolls, the improvement which comprises a sleeve covering at least the major proportion of a roll normally contacted by the metal strip during operation of the electrolytic apparatus, the sleeve comprising an organic polymeric material that is non-wettable by the liquid.

Buffing Wheel Hub

U. S. Patent 2,922,262. *Jan.* 26, 1960
D. Atkins, assignor to American Buff Co.

A hub for mounting a plurality of buffing sections on a spindle.

Dual Spray Painting

U. S. Patent 2,922,584. *Jan.* 26, 1960.
A. D. Slatkin, assignor to Ford Motor Co.

In an electrostatic paint applying apparatus, a housing, an atomizing head on said housing comprising a pair of coaxial cups, concentric shaft means within said housing rotatably supporting said cups, drive means coupled to said shaft means and constructed and arranged to rotate the inner cup at a higher speed than the outer cup, and conduit means extending through the inner of said concentric shaft means, said conduit means having a first discharge port opening into the inner cup and a second discharge port opening into the outer cup whereby paint is supplied to the inner surface of each of said cups from the common conduit means, both cups being rotated at a speed sufficient to atomize the paint solely by centrifugal action.

Abrading Device

U. S. Patent 2,923,100. *Feb.* 2, 1960.
L. G. Simjian, assignor to Reflectone Electronics, Inc.

Apparatus of the character described comprising: a receptacle; a magnetizable abrasive mixture in said receptacle in which an article to be abraded may be immersed; magnetic means disposed to rigidify the mixture about the article yet permitting limited motion of the article relative to the mixture, and means bodily displacing the receptacle and article by imparting motion to the receptacle while the mixture is rigidified.

Contact Wheel with Interlocking Sections

U. S. Patent 2,923,103. *Feb.* 2, 1960.
W. J. Cosmos

A contact wheel for abrading and polishing machines comprising a plurality of wheel units secured in face to face relation, each comprising a central part composed of a pair of discs having outwardly opposed peripheral flanges and a resiliently yieldable hub part aranged centrally of each disc.

Method of Improving the Bonding Properties of Steel Surfaces

U. S. Patent 2,923,608. *Feb.* 2, 1960.
P. H. Margulies, assignor to Food Machinery and Chemical Corp.

The method of improving the bonding properties of mild steel surfaces which comprises treating the steel for a period of at least 20 seconds with a solution containing about 20 to 65 weight per cent of water, 5 to 30 weight per cent of H_2O_2 and 25 to 70 weight per cent of mineral acid in such proportions that the sum of percentages of water, H_2O_2 and acid equals 100% and then rinsing the steel.

Di-Phase Cleaning System

U. S. Patent 2,923,648. *Feb.* 2, 1960.
R. T. K'burg, assignor to E. I. du Pont de Nemours and Co.

A continuous process for cleaning surface-contaminated, non-porous articles which comprises: (1) providing a di-phase bath consisting of a lower solvent phase having a density substantially greater than water and an upper water phase, the temperature of said di-phase bath being not greater than the boiling point of the water-solvent azeotrope, (2) successively dipping said articles through said water-phase into said solvent phase, conveying them longitudinally through said solvent phase in one direction and removing them through said water phase so that soil soluble and dispersible in both phases will be removed and (3) maintaining constant, distinct and separate flows of the fluids constituting the upper and lower phases, the flow of the lower phase being counter-current to the longitudinal movement of the aforesaid articles through the bath.

Abrasive Blasting

U. S. Patent 2,924,911. *Feb.* 16, 1960. *R. M. Leliaert, assignor to Wheelabrator Corp.*

A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, and magnet means disposed to embrace said opening and operable to project a magnetic field extending from the marginal edge of said opening to span the opening, whereby media will become entrained by said magnetic field and agglomerate to form a wall of media particles clinging together in such manner as to close said opening against passage therethrough of other projectile media particles while permitting penetration and/or withdrawal therethrough of workpieces..

Silvering Process

U. S. Patent 2,924,535. *Feb.* 9, 1960. *V. J. Schaefer, assignor to General Electric Co.*

A process of preparing a metallic silver, mirror-like coating on a selected area of the surface of a solid which comprises coating said area with an aqueous solution containing polyvinyl alcohol and a water soluble silver salt and heating the coated area to a temperature in the range of 75-200°C. until the silver coating is formed.

Treating Anodized Aluminum

U. S. Patent 2,924,539. *Feb.* 9, 1960. *H. Arndt and H. Seiler, assignors to Midwest Manufacturing Corp.*

A method of treating an anodized aluminum surface to produce a substantially permanent wettable coating on said surface which comprises immersing said surface in a solution at a temperature substantially within the range from 200°F. to 210°F. for at least seven minutes, said solution containing a wetting agent selected from the group which consists of ethylenediamine tetraacetic acid and salts of said acid.

Degreaser

U. S. Patent 2,924,229. *Feb.* 9, 1960. *T. J. Kearney and J. H. Nuber, assignors to Detrex Chemical Industries, Inc.*

A machine comprising an enclosure adapted to contain a chlorinated hydrocarbon solvent, a rotatable frame of elongate construction with a middle portion having an axis mounted on said enclosure, said frame having capacity for movement in a rotary path therein so that its ends follow a circular path, a work object carrier mounted on an end of the rotatable frame, power means for rotating said frame thereby swinging said carrier in a circular path through the solvent, and carrier rotating means continuously rotating said carrier during rotation of said frame.

Selective Plating Apparatus

U. S. Patent 2,924,564. *Feb.* 9, 1960. *W. H. Jackson, assignor to The Udylite Corp.*

In an apparatus having a plurality of work-supporting means mounted for travel through a succession of liquid-treating positions, a circuit means for each of a number of said positions and each including an anode, an electric current source connected thereto and means for establishing and interrupting the flow of electric current between said anode and said work-supporting means, an engaging means for each said work-supporting means each mounted so as to be moveable in a given zone relative to the path of travel of said work-supporting means, said current establishing and interrupting means being arranged along the path of travel of said work supporting means and spaced in a stepwise manner across the zone of movement of said engaging means, and means on each said work supporting means for moving its respective engaging means to a position in said zone wherein it will actuate a predetermined number of said current establishing and interrupting means in response to the movement of said work-supporting means through said succession of liquid-treating positions.

FOREIGN LITERATURE

Additives in Metal Pickling Baths

E. Mayer: *Galvanotechnik*, (Germany), **50,** 596.

Modern pickling baths differ greatly from the older types, in giving cleaner metal surfaces with a lower metal loss and less hydrogen embrittlement. The reason for this is the numerous additives that have been developed to prevent bath attack on the metal (inhibitors), to reduce the size and number of the hydrogen bubbles on the pickled surface (wetting agents and emulsifiers) and to prevent penetration of hydrogen into the metal.

The absorption of hydrogen by iron and steel increases with the carbon content present in the steel. A large number of satisfactory commercial additives is now available to prevent this. Other additives have also been develcped for aiding the detachment of mill scale, the removal of rust flakes from the surface and the conversion of adherent rust into relatively harmless products.

Influence of Naphthalene Sulfonic Acids on Electroplating of Nickel; Part 3. Acidity of the Electrolytes

A. W. Pamfilow and O. E. Pantschuk: *Ukrain. chim. Zhurnal* (Russia), **24,** No. 3, 399.

In this work, it was demonstrated how the mutual influencing action of the significant bath factors operates in a co-ordinated manner, i.e. bath temperature (25-55°C.), current density (0.5-4.0 amp./dm.^{2}) and pH (3.0-6.0) on the wear resistance and the surface brilliance of the nickel deposit (judged on a scale of 0-10 ranging from mat to mirror bright).

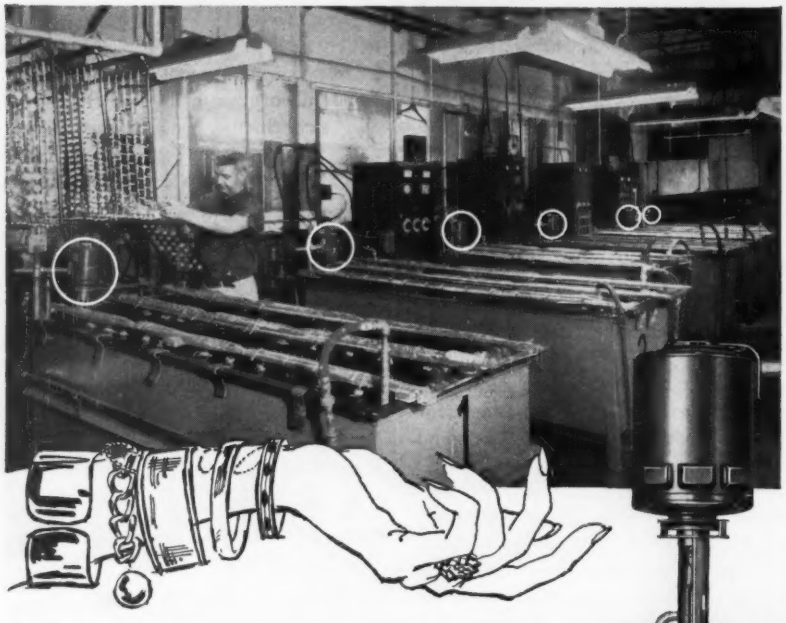
The compound 2, 6- and 2, 7-naphthalene sulfonic acid was used as the bath addition to which, in some cases, small amounts of quinoline were added. It was found that the result depends on the characteristics of the colloidal nickel sulfide formed with the decomposition of the addition agent in the cathode area.

New Pickling Acids for Bright Pickling Effects

M. Straschill: *Galvanotechnik* (Germany) **50,** 589.

Phosphoric and chromic acids are the best known of the group of acids discussed here. Their use for processing the enamelling steels, copper, and aluminum has not been very widely discussed. The major use of hydrofluoric acid is for pickling aluminum. This acid has the advantage over most other acids in that it is able to remove the oxide film without attacking the

"Now we can run
THREE MONTHS BETWEEN
CARBON TREATMENTS..."



bergère, inc., of Providence, manufacturers of fine costume jewelry, purchased six WINSCOTT FILTERS for use in their bright nickel plating operation. John Henry, head plater for bergère, had this to say about the filter:

"We used to break down our nickel tanks once a month for treatment and sludge removal. Since we've been using the new Winscott Filters in each tank for continuous filtration, we can run three months between carbon treatments. Even with this long interval, there is never any sludge in the tanks."

Pat. No. 2,667,270

The new
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- Keeps Surface Clean Constantly Regardless of Solution Level
- No Solution Loss Due to Leaks . . . Most Important in Precious Metal Solutions
- Solution Agitation Built into Filter
- Entire Filtering Unit Submerged in Tank, Cannot Aerate Solution
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- Large Filter Area at Low Cost . . . Easy to Clean
- Corrosion Resistant Construction Throughout

Check these features again and write for further information and name of your nearest distributor.

The Chemical Corporation
58 Waltham Avenue • Springfield 9, Massachusetts

metal and gives clean, white surfaces when the aluminum contains copper and silicon. It has the same effect with zinc and copper alloys and metals but, when used with steel, it is usually mixed with hydrochloric, sulfuric, or nitric acids. Hydrofluoric acid cannot be used hot because of its high volatility but it can be used in the form of its sodium salt.

Amidosulfuric or sulfamic acid resembles sulfuric acid, but is less aggressive and has the advantage of being solid. It also forms soluble calcium, barium, and lead salts, as compared with the sulfates of these metals, which are insoluble. Fluoroboric acid is another strong acid which has already found extensive use in plating baths. It readily dissolves lead and other metals.

Pyrophosphoric acid is similarly related to phosphoric acid, being less aggressive and easily forming soluble complexes. With sensitive metals it can be used to remove oxide coatings without attacking the basis metal.

Hydrogen Adsorption in Steel Springs during Plating Treatments

S. B. Anisimow: *Aviacionnaja promyslennost* (Russia), **27,** No. 10, 67.

The author discusses the procedures which influence the hydrogen adsorption. Matters considered are the kinetics of the hydrogen adsorption and processes for the removal of the hydrogen. Conclusions are drawn and recommendations are given for the plating treatment of steel springs.

Automatic Plating Layouts for the Processing of Screws, Bolts and other Small Parts

Draht (Coburg, Germany), **10,** No. 9, 481.

When manually operated, continuous barrel plating layouts were introduced, distinct progress had already been made as compared with the more common individual plating units. However certain disadvantages were still present with these newer layouts, which were:

1. The transport of the cylinder from one bath to another, required a considerable expenditure of time even when conducted with the aid of electrical lifting and transporting equipment, because each working unit can service only a relatively small area of a layout;

2. The quality of the coatings, which

is strongly influenced by the individual processing times at the various working stages, depends to a great extent on the skill and attention of the operating labor.

3. The working stages which have become even greater, particularly with the pre- and after-treatments, require a series of mechanical handling units with a defined working range, the coordination of which to one another is not simple.

Because of these difficulties, there arose the need of developing full-automatic layouts for bulk-parts plating. From the beginning, it did not appear advisable, for this particular plating task, to install the usual automatic plating units operating with a rigid work program given by the chain transport system. This was because the fixed handling time with the individual cycles is not very suitable for the processing of the bulk parts under consideration.

In addition, plating layouts of this type, when adapted to operate with cylinder-plating become dimensionally too cumbersome because, with long treatment times, the plating cylinders must be arranged with their longitudinal axis in the conveyor direction of travel. This is so as to remain in the full working efficiency range of the anodes. Suitable layout designs to overcome these difficulties, are described.

Advantages of Hard Chromium Plating as Compared with Metal Spraying and Weld Surfacing

W. Schmitt: *Werkstatt und Betrieb* (Munich, Germany), **92,** No. 2, 77.

In spite of higher processing costs, hard chromium plating for surface improvement is superior to treatment by metal spraying and weld surfacing, for wear resistance. After-treatment processes, such as smoothing-off and grinding-down, can be dispensed with. The advantageous characteristics and applications of hard chromium plating are described in detail. These characteristics are: Very high hardness of the chromium coating, very high wear resistance; good adhesion to the base: good corrosion resistance; low working temperature; reproducibility of the hard chromium coating without change of the original dimensions; with no after-working being required; possibility of internal chroming of small boreholes; application of relatively thin coatings.

FOR LASTING BRIGHTNESS

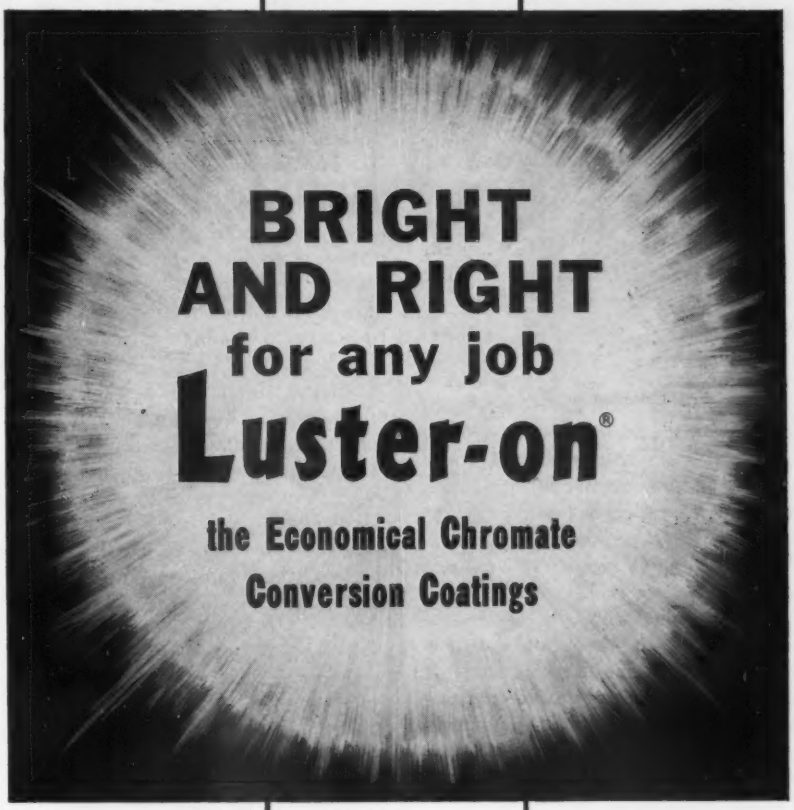
on both copper and brass without noxious fuming.

FOR ALUMINUM

where the surface hardness of anodizing is not required.

FOR DIE CASTINGS

uniform, low-cost finish ideal for later painting.



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rivaling chrome for many applications where cost is a factor . . . long-lasting easily controlled applications.

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most attractive appearance where corrosion protection, humidity, handling are involved during processing . . . at extremely low cost.

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RECENT DEVELOPMENTS

NEW

METHODS, MATERIALS AND EQUIPMENT FOR METAL FINISHING INDUSTRIES

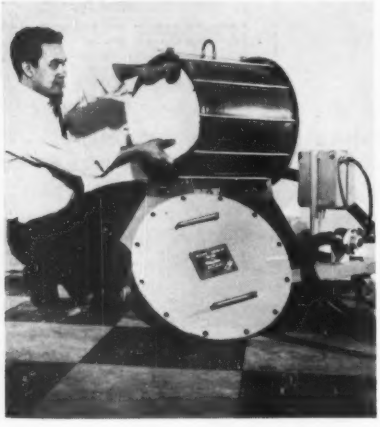
Solution Filter

Udylite Corporation, Dept. MF, 1651 East Grand Blvd., Detroit 11, Mich.

An easy-to-maintain filter opens from the side instead of the top for cleaning and service. Mounted on its own base, the filter is a portable unit used to remove solids and chemical contamination from nickel, copper, cadmium, and zinc plating solutions.

The new Series 60 filter operates at low pressures and low speeds. Hollow filter plates set vertically in the new machine provide greater filtration area to permit operation at lower pressures and speeds with no loss in efficiency. When cleaning is necessary, all plates can be removed easily and quickly from the side opening.

Depending on the size, the new filters use positive displacement or centrifugal pumps that develop a maximum pressure of 28 psi. The pumps and motors are mounted on the base with the filter, and are readily accessible for servicing.



The new filter design provides a minimum of metallic parts in direct contact with plating solutions. There are eight standard sizes of the filter, ranging from 200 to 10,000 gallons per hour capacity. Variations to meet particular service requirements are also available.

Vacuum Metalizing Coating

John L. Armitage & Co., Dept. MF, 245 Thomas St., Newark, N. J.

A new thermo-set coating for use on polystyrene, acrylic, phenolic and other plastic materials and products being vacuum metalized provides a thicker film and superior wear and humidity resistance to coatings currently available, it is claimed.

Designed for use on a wide variety of products including novelty jewelry, control knobs and cases for transistor radios, the coating is applied either by dipping or spraying. The base coat is baked for one hour at 150°F., the product is vacuum metalized and the top coat then applied and baked for another hour at 150°F.

Chemical Specialties

DuBois Chemicals, Inc., Dept. MF, 634 Broadway, Cincinnati 2, Ohio

A-612 is a modern, powdered, aluminum etchant, formulated to produce satin-like finishes. Special sequestering agents give greater control during the processing. Used in concentrations of 2 oz./gal. of water, the product is claimed to be an improvement over previous products for cleaning and etching. Improved smut control, a reduction in tank scale build-up and tank sludge, and controlled foam blanket are noticeable, it is stated.

Zip-It is a low cost, plastic paint spray booth mask. It is easy to use and sprays on using regular spray equip. ment. Average booths are masked in 15 minutes, and the material is resistant to acids, alkalies, gasoline, fats and oils.

Reinforced Plastic Pipe

Ceilcote Co., Dept. MF, 4832 Ridge Road, Cleveland 9, Ohio

A standard line of Duracor reinforced plastic corrosive waste pipe features high strength, positive sealing, lower installed cost and lasting corrosion resistance. Fabricated in 10-foot lengths to minimize troublesome joints, the pipe features bell-and-spigot construction joined on the job site with identical resins and random fiberglass mat to provide positive sealing.

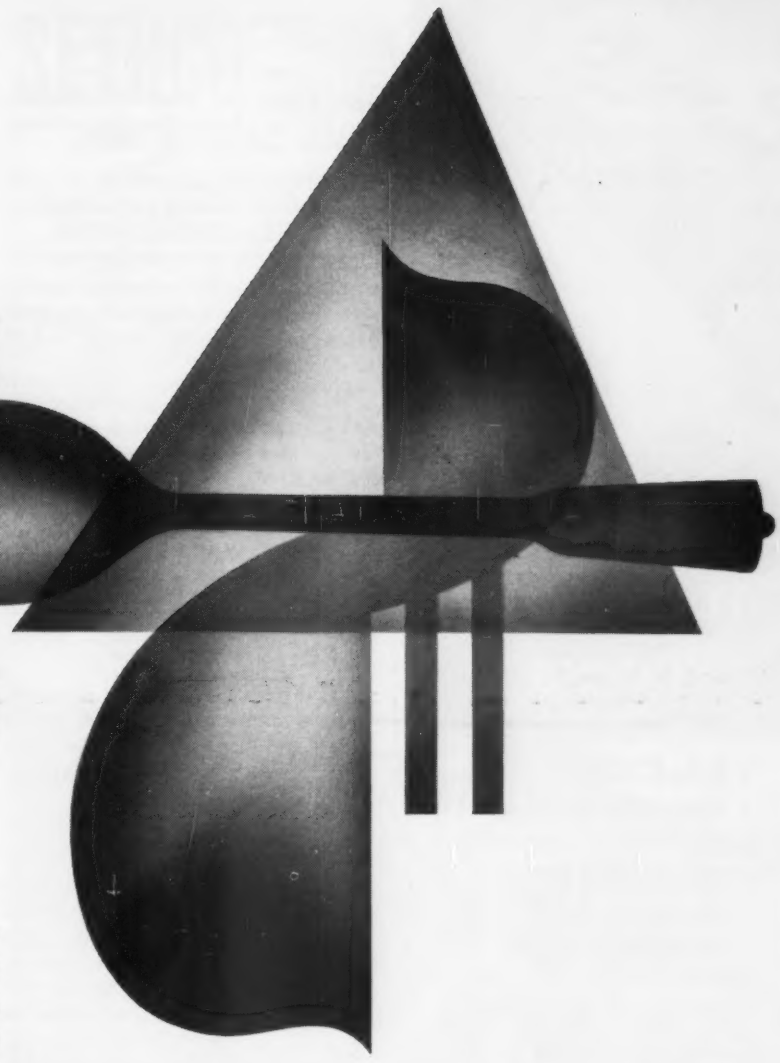
These systems offer substantial savings over conventional tile or pipe. Each light-weight unit can be lifted and set in place by just two men without the assistance of lift trucks, cranes or other mechanical equipment. Depending on surface traffic, the new pipe can be completely encased in concrete, set in a concrete cradle and backfilled with sand, or laid on sand and backfilled with sand.

Finishing Processes

Allied Research Products, Inc., Dept. MF, 4004 E. Monument St., Baltimore 5, Md.

Three new formulations of Iridite chromate conversion coatings are now available, along with two new brightening addition agents for zinc plating baths, and a new addition agent for copper plating solutions.

Iridite #1P is a powdered version of the original #1 (olive drab), and provides the same advantages of corrosion protection, paint adhesion and



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- NON-ELECTRIC
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Refinish *Recodized* surfaces after years of exterior exposure without removal from installation!

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final finishing as its liquid counterpart but offers easier solution control. This material produces a dark green, olive drab film on zinc plate and a similar film, having a brown cast, on cadmium plate.

Iridite #7P is a powdered form of #7, which can be used not only to produce high luster with a chemical polish on cuprous surfaces, but can also be used to provide protection against corrosion and tarnishing ranging from a heavy-duty film to merely a mild passivation.

#11P provides a one-dip, clear, white, bright protective and decorative film on zinc plated surfaces. The film can be dyed to provide a variety of beautiful pastel shades with excellent continuity of color and uniformity of coating. A particular advantage in production is the fact that the film can withstand transfer times of up to 30 seconds without changing its appearance and dye receptivity.

All three of these new powdered products are shipped in 100 pound drums for production orders with quarter-pound cans being available as samples for testing.

The new Isobrite brighteners, #333 and #334, are for high current density plating in cyanide zinc solution. Both are shipped in liquid form in 5 gallon pails containing 40 pounds or in the Auto-Flo-Pak containing 9 pounds. Their formulations and results are identical, the major difference between the two being the #333 is a more concentrated form. Each provides economy of operation, long life, excellent throwing power, a wide current density range and fine-grained, bright deposits.

Isobrite #625 is a liquid organic addition agent designed to transform a basic copper into a high-speed, high efficiency, semi-bright copper. While it primarily provides a smooth, ductile deposit for buffing, the deposit also has excellent characteristics as a stop-off for heat treating. The product has a high tolerance for impurities such as chromium, sulphur, zinc, and lead, and is lost from the bath only through drag-out or by uniting with impurities. Thus, it provides an exceptionally stable system which is easily controlled. It is designed for use in a wide range of installations ranging from small barrels to large buffing operations, and is shipped in one-gallon bottles, four to a carton.

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Buff-Wear Compensator

Packer Machine Co., Dept. MF, 456 Center St., Meriden, Conn.

A "packaged" electronic adjustment device, the Adjusta-Matic, automatically compensates for buff or wheel wear in high production rate finishing operations, and is claimed to result in reduced wheel wear, gives a more uniform finish and lowers high compound costs.

The electronic device is included with all the above firm's polishing machines, and can be installed easily on units currently in the field. It is completely and automatically controlled through ampere flow by means of a special control panel where specified limits of operation are set on simple, easy-to-read dials. Compensating vertical, horizontal or in-line adjustment to the buff or wheel takes place as the amperage flow to the sensing load detector varies.

By setting the optimum amperage range, within which the greatest efficiency of operation is achieved, this level may be continuously held without alleviation from the operator. Control relays and timers furnish rapid response or delayed action, depending on individual requirements.

Titanium Anode Baskets

Titanium Products Corp., Dept. MF, 9301 French Road, Detroit 13, Mich.

A new and improved line of all-titanium anode scrap baskets is now available in sizes 3″ x 12″ x 12″, 3″ x 12″ x 18″, and 3″ x 12″ x 24″.

These baskets will give long life in all acid plating solutions and are now available for delivery from stock at new reduced prices. Catalog upon request.

Anti-Tarnish Paper

Daubert Chem. Co., Dept. MF, 4700 S. Central Ave., Chicago 38, Ill.

Daubrite, a new chemically-treated paper which prevents tarnish and oxidation of copper, brass, bronze and cadmium, represents the first successful use of volatile corrosion inhibitors in connection with the protection of these metals, it is claimed.

Tests, which included high humidity and temperature and exposure to heavy sulfide and oxygen atmospheres, indicate at least two year's protection when metals are properly packaged.

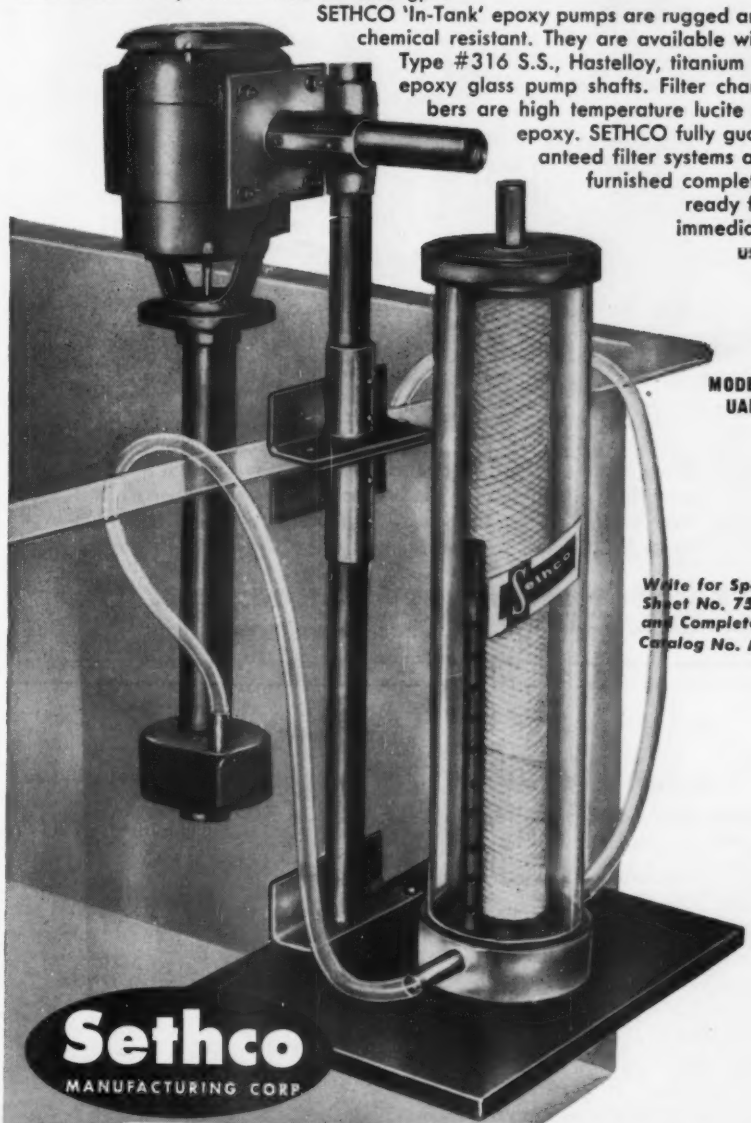
SETHCO 'In-Tank' PUMP Outside FILTER SYSTEM

offers universal, self-priming, maintenance-free, leakproof operation

COMPLETE CHEMICAL RESISTANCE AND FULL-VIEW FILTRATION UP TO 250° F.

Filter pumps were not meant to be submarines. SETHCO detachable filter chambers are always outside the tank for full-view filtration, for swift cartridge cleaning without disturbing tank operation. SETHCO 'In-Tank' Pumps can be positioned just below liquid surface or can be equipped with extension strainers to filter at any level from tank bottom up. Pumps can be used for agitation or transfer. Harder working ½ or ¾ hp motors can accommodate all size filter chambers by throttling from open pumping capacities of 900 and 1800 gph to filter chamber capacities of 50 to 1200 gph.

SETHCO 'In-Tank' epoxy pumps are rugged and chemical resistant. They are available with Type #316 S.S., Hastelloy, titanium or epoxy glass pump shafts. Filter chambers are high temperature lucite or epoxy. SETHCO fully guaranteed filter systems are furnished complete, ready for immediate use.



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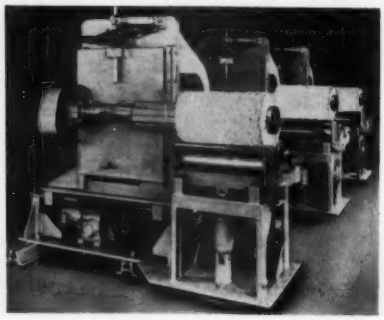
Wide-Face Wheel Head

Murray-Way Corp., Dept. MF, P.O. Box 180, Birmingham, Mich.

New wide-face wheel heads, specially designed for continuous buffing of aluminum, brass, or steel coil stock, are unique, in that they may be placed in tandem and angularly positioned for cross-cutting action. The complete head oscillates, allowing more uniform buffing, and a special jog automatic wheel positioner is provided to compensate for buffing wheel wear.

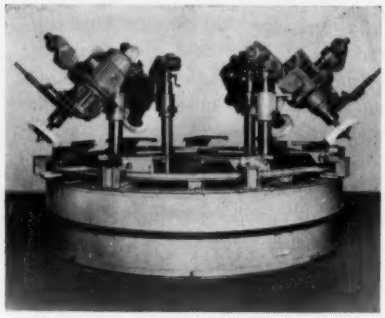
A billy roll supports the strip at the buffing point. When stitched or welded coil ends pass under the buffing head, the billy roll automatically "drops out," allowing the strip to run free.

Buff sections are mounted on a separate, balanced, bearing-supported sleeve. The buffing heads shown are 24 inches wide, but provisions may be made for use of buffing heads of larger or smaller widths.



Automatic Polishing Machine

Acme Mfg. Co., Dept. MF, 1400 E. Nine Mile Road, Detroit 20, Mich.



A new automatic polishing and buffing machine features a rotary conveyor design which cuts floor space requirements for finishing high production parts. The parts are loaded and unloaded from one position on the periphery of the machine.

The 12-ft. dia. machine consists of a rotating outer conveyor ring and a stationary inner ring. Work pieces are mounted on fixtures on top of an 8-in. wide table on the rotating ring and move past buffing wheels mounted on adjustable lathes spaced around the inside of the conveyor. Cam rails mounted on the stationary inner ring can operate in conjunction with pivoted fixtures to move the part to controlled positions at various stations around the periphery of the machine.

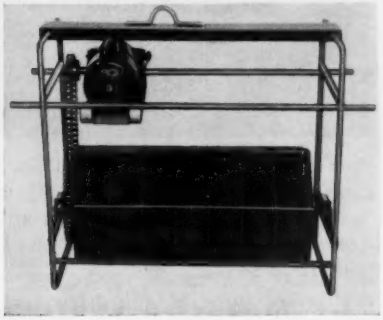
The number of work fixtures (usually a maximum of ten) mounted on the table varies with part shape, length and finish requirements. Up to six adjustable lathes can be placed inside the rotary conveyor. An equal number can be mounted around the outside, if required. The conveyor travels at speeds from 8 to 32-fpm depending on the part shape, loading requirements and number of finishing stations.

The machine is designed to provide minimum maintenance. The rotating table travels on fixed ball bearing rollers. The ring supporting the table is held concentric by adjustable ball bearing rollers, and is driven by an externally mounted power unit. This unit includes a 1½-hp motor, a worm gear speed reducer and a variable speed drive unit. A sprocket on the end of this unit drives the outer ring through a standard roller chain attached to the periphery of the ring.

Metal Tumbling Cylinders

Bix Co., Dept. MF, Fairgrounds Road, Wellington, Ohio

"Clear-Flow" tumbling units for production washing, blackening, pick-



ling, and annealing feature looped wire cross rod type liners forming slotted openings assuring the user the maximum of clear open area.

Maximum open area guarantees the ultimate in circulation of liquids, giving faster cycling time with increased loads. Tumbler support frame of solid round rod construction minimizes liquid transfer and guarantees safety by accessible examination of tumble frame.

Rust Inhibitor

Brad Chemical, Inc., Dept. MF, 111 W. Washington St., Chicago 2, Ill.

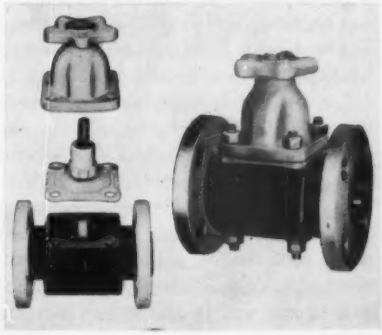
"Poly-Rustex" is a special combination of active materials dispersed in an oil carrier base. The exclusive ingredients penetrate deeply through existing corrosion to the bare metal and form a solid air-and-moisture-tight seal, thus preventing formation of new rust. Claimed to be the only clear rust inhibitor on the market, it will not discolor the metal, yet provides complete protection that will not wash or wear away under normal conditions.

The product comes ready to use without mixing, and can be applied easily and quickly to any metal surface by a variety of methods: brush, spray, mop or dip. Due to its special formula, it is extremely economical — a single gallon covers up to 400 square feet. It is low in viscosity, non-settling and non-freezing, permitting storage indoors or out in any weather.

Graphite Diaphragm Valves

Falls Industries, Inc., Dept. MF, Aurora Road, Solon, Ohio

A new series of small diameter impervious graphite diaphragm valves is simplified in design with standard flanges attached. An Impervite graphite body is utilized with a Hills-McCanna (Saunders patent) bonnet. Diaphragm material is normally Teflon.



These valves are unaffected by almost all corrosives, are immune to effects of thermal shock, are non-contaminating, accommodate operating pressures to 50 psi at temperatures to 340°F. and can handle gas, liquids, or slurries. This valve can be maintenanced, or the line can be rodded without removing the valve from the line, because the bonnet is independently removable. Available operators include manuel hand wheel, fast acting lever, or automatic operators.

The valves are now available in seven sizes to 8 inches in diameter. The larger diameters can be steel encased where required.

ZERO-MIST

world's largest plating supplier

udylite

Zero-Mist can mean cost savings for you.

There is sound reason for the steady increase in the use of Udylite Zero-Mist over the past six years. Users everywhere have learned that here is the *one* mist suppressant that actually *does what it's supposed to do.*

With Zero-Mist you immediately add cash savings to your budget. Here are the six different ways costs conscious platers effect substantial operating economies with Udylite Zero-Mist.

- Eliminate *completely* the health hazard of dangerous chromic acid mist . . . it beats the most stringent code limitations.
- Save expense of chromic acid loss from mist and drag-out.
- Avoid permeating the outside air with destructive fumes.
- Eliminate contamination of adjacent baths.
- Sharply reduce costly waste disposal.
- Reduce equipment maintenance.

Before you invest in expensive air wash ventilation and blower equipment, ask your Udylite man what Zero-Mist can do for you.

the udylite corporation

detroit 11, [illegible]

on the west coast: L. H. Butcher Co.

Protection and decoration of the metal seat backs in Chrysler Corporation's new compact VALIANT station wagons is one of the many applications for this unusual coating

ARMORSOL offers you these important advantages:
- An adherent vinyl finish competitive in price with baked enamel.
- 5 times more abrasion resistant than baked enamel of equal film thickness.
- Available smooth, textured, gloss, semi-gloss or almost optically flat.
- Does not discolor with aging.
- Excellent mar, humidity, salt spray, chemical, solvent and burn resistance.
- Handled like conventional paints with standard paint equipment. Will adhere without primer to steel, aluminum or zinc surfaces which have been washed and phosphatized.

Send for Bulletin and Sample Panel

ARMORSOL

John L. Armitage + Co.

SYNTHETIC ENAMELS • VINYLS • VARNISHES • LACQUERS
245 Thomas Street • Newark, New Jersey

Wax Solution

International Products Corp., Dept. MF, New York and Ferrier Ave., Trenton, N. J.

Since Sep-A-Wax is a true solution, it deposits a continuous film when it is applied to a surface. It is insoluble in water or oxygenated materials, and presents an effective barrier to the adhesion of most synthetic finishes and plastics. This makes the wax useful for masking, mold release and other applications where adhesion must be prevented.

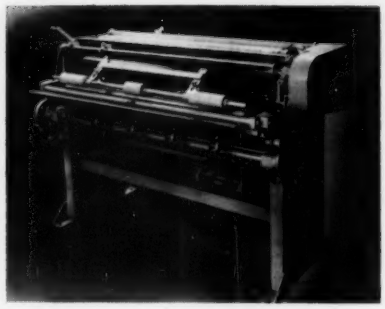
Since its viscosity is low, it may be sprayed, painted, or swabbed on with a cloth, or the part to be masked may be dipped in the solution. The wax may be cut back with any hydrocarbon or chlorinated solvent.

Wood Graining Machine

M-H Standard Corp., Dept. MF, 517 Communipaw Ave., Jersey City 4, N. J.

The new Model P495-50 Morrison Wood Grain Printer has a printing width of 50″ to handle panels up to 48″ wide and is adjustable for panels from ⅛″ to 2″ thick.

The new enlarged 15.75″ diameter engraved cylinder produces a high fidelity print with wide repeat spacing. This roll is available in standard wood grain patterns of mahogany, walnut, cherry, oak, maple and others. Rare and exotic woods and other patterns



such as marble are available at additional cost. Various combinations of base coat and printing ink colors produce a wide range of striking effects with the same roll.

Printing speed is adjustable from 35 to 70 ft./min. Drive motor is 1 HP explosion proof. An explosion proof start stop control is mounted on the machine. The frame is of heavy duty steel construction. Cylinder bearings are sealed, self aligning ground ball bearing type with pressure grease fittings. All cylinders are readily removable. The printing cylinder is of a highly flexible special composition, virtually unaffected by temperature, humidity and printing solvents. The engraved cylinder is copper plated, ground, polished, photo-engraved and chrome plated.

Uncut Resins for Baking Type Metalizing Lacquers

Schwartz Chem. Co., Dept. MF, 50-01 Second St., Long Island City 1, N. Y.

Uncut resins, direct from the cooking vat, that are particularly well suited for metalizing, permit adjustment of solids content and viscosity by the user to meet specific needs. They are suitable for thinning with low-cost, readily available materials with flash points above 100°F.

Adjustment of solids content and viscosity, by the user, permits the application of a high solids mix for uniform, high gloss on porous and rough die castings, or a very thin coating on smooth metal surfaces for the same type of finish.

For most uses a 50:50 resin: thinner mix is entirely satisfactory. This mix of low viscosity and high solids results in a high build, glassy surface that is an ideal base coat for maximum reflectance from aluminum or silver deposits.

Standard baking schedule ranges from 20 to 60 minutes at temperatures

ranging from 250 to 350°F. In the use of infra-red heating with automatic conveyors the curing time may be speeded up to two minutes.

"MC baking type lacquer resin" has an extremely pale straw color which is suitable for use on silver nitrate coatings and for protection of polished brass, aluminum, and zinc die-castings. It is sold by the pound in standard five-gallon pails and 55-gallon steel drums.

Tumbling Barrel

Tumb-L-Matic, Inc., Dept. MF, St. Mary's St., Stamford, Conn.

Designated Model XLC-2120, this new barrel finishing unit is mounted in a rugged welded iron frame and supported in oversize bearings at each end of the shaft. The hexagonal barrel is 20″ in diameter, 21″ long and lined with ¼″ thick neoprene. Based on manufacturers' individual needs, the barrel is supplied unlined or with abrasive-resistant rubber. It can be utilized for wet or dry processes.

Barrels are supplied with 2 types of drives. One type involves constant speed (set to user requirements) and the other is variable in a ratio of 10:1. The gear head motor drive has a 24-hour continuous rating and operates through a chain to the barrel shaft. The drive is located outside the machine frame allowing easy access and maintenance. Standard equipment includes a magnetic start and stop electric control switch with thermal overload protection.

Beneath the barrel is a unique work and compound separation system. The top tank screen retains work while the barrel is unloaded. The screen allows the media to fall through to another screen directly beneath; this retains the media while only water and compound pass through.

During the A. E. S.
1960 Convention in Los Angeles
Be Our Guest

Cocktails, music and entertainment
5 to 7 p.m.
East Garden Room
the Statler Hilton Hotel

The Annual Udylite—A. E. S. Ball
In the Golden State Room
the Statler Hilton Hotel
10 p.m. to 2 a.m.—Thursday, July 28
Marshall McGraw and his Music

THE UDYLITE CORPORATION
Detroit, Michigan

THE L. H. BUTCHER COMPANY
Udylite on the west coast

Ventilating Fans

Propellair Div., Robbins & Myers, Inc., Dept. MF, Springfield, Ohio.

Since ventilation systems are frequently altered during their life, usually to increase capacity, a new line of belted axial flow fans is designed to simplify this change. A new bearing assembly suitable for loads to 50 HP is furnished with each fan in the line, regardless of initial HP ordered. Another construction feature is the universal motor mounting plate, predrilled for all motor frame sizes the fan can accommodate, so that capacity may be readily altered.

Both standard and high pressure propellers are available, depending on system requirements, all with aluminum-magnesium alloy cast airfoil section blades for highest efficiency. The fans range from 30″ to 60″, supplementing smaller units already in the line, and air deliveries are now available to approximately 85,000 cfm.

Other fan features permit use in temperatures to 350°F. without special accessories; for higher temperatures, special lubricable bearings can be provided. Fans are Factory Mutual Approved for use in explosive atmospheres. Special coatings are available for interior fan surfaces when handling corrosive or abrasive exhaust.

For paint preparation that meets the new higher standards of the automotive industry use

KELITE KEYKOTE® 32

immersion

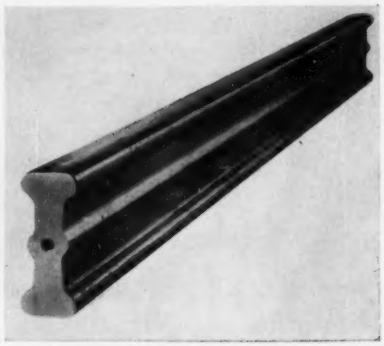
zinc phosphate coating

Keykote® 32 solutions yield highly effective, fine-grained, uniform coatings. These coatings provide corrosion protection, economy of paint consumption, and excellent paint adhesion. Coating formation is fast; no special pre-treatments are required; black iron or mild steel equipment can be used.

For further information or a Product Bulletin, contact the nearest Kelite Office listed below.

KELITE CORPORATION

• Los Angeles 12 • Chicago 45 • Berkeley Heights, N. J.



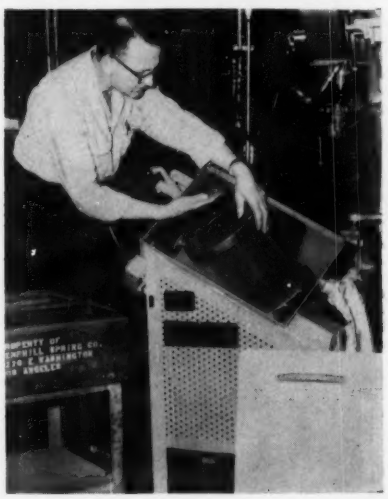
sludge. This characteristic is provided by controlled amounts of boron and zinc, with an upper limit of 0.01 per cent combined, and permits operation without bagging the anode, it is stated.

Blast Cleaning Barrel

Metal Improvement Equip. Co., Dept. MF, 1721 E. 47th St., Los Angeles 58, Cal.

Peenamatic Model 920 was specifically designed to process small and medium sized parts of a great variety of shapes which could not be handled economically by conventional equipment. Shot and grit are easily changed in this machine. Parts are loaded into the easily removable hexagonal barrel which is then placed into the cabinet. After the lid is closed, the barrel is constantly rotated exposing all sides of parts to the blast stream. Pressure is adjusted by regulator and gage. A moisture trap and fiberglass dust bag are standard accessories.

The unit 920 is compact, using only 2 x 2′ floor space, with very modest requirements of only 30 cfm of air at 90 psi with a ⅛″ air jet. It can be connected to any 110 volt outlet. Compactness and moderate price recom-



Plating on Aluminum and Magnesium

Mag-Al Plating Systems, Inc., Dept. MF, 709 E. 106th St., Indianapolis 20, Ind.

The Mag-Al process for plating on magnesium and aluminum is claimed to overcome the drawbacks of the zincate process. By electrodepositing the zinc film instead of applying it by chemical displacement, a true bond is obtained, as well as a thicker zinc coating.

The zinc coating is obtained by plating for 10-15 minutes in a solution made up by diluting 25 gallons of DZ-10 concentrate with 75 gallons of water. Operation of the solution is at pH 2-2.2 and room temperature. The bath is readily controlled by adjustment of the pH and the specific gravity, but free analytical service is also provided by the supplier.

"T Bone" Nickel Anodes

Univertical Corp., Dept. MF, 14841 Meyers Road, Detroit 27, Mich.

This new dogbone design anode is concave at the center and convex or bulbous at the edges to offer more nickel area in the sections where heaviest dissolution takes place. Suitable for air-agitated solutions, the anode is claimed to corrode uniformly with the production of a dense, adherent brown film on the surface, and a minimum of

mend this machine for economical and versatile in-plant operations.

Bench-Type Barrel Finisher

Rampe Mfg. Co., Dept. MF, 14915 Woodworth Ave., Cleveland 10, Ohio

A compact, portable precision finishing machine, Model RA4 Rollabrader, processes four barrels at one time and has 20 to 46 rpm variable speed drive. Barrels are each two-quart capacity, with orange "No-Seam" vinyl plastic lining.

Powered by dual drive shafts, the unit has neoprene rollers in direct contact with each barrel flange. Belt and pulleys are safety-enclosed. Barrels are easily removed by simply lifting them from the drive rollers, permitting extra barrels to be loaded while others are processed on the machine. The speed changer is hand-wheel operated. The machine measures 31" long x 38" deep and 25¼" high.

Look! before you junk
at the Udylite
Project Alert Barrel Program
Hundreds of barrel units have already passed through our Project Alert lines. Every job from the simplest repair to complete renovation has meant equipment salvaged—its useful life extended and real cash savings for plating operators everywhere.
Through Project Alert, barrels in any condition are renovated and returned to the line. The program is flexible . . . it provides the exact restoration necessary to put each crippled unit back into productive use. It works! . . . it has proven a valuable economy for hundreds of satisfied Udylite customers.
Get "extra mileage" from your tired, worn out barrel equipment. Ask your Udylite man now or contact Lee Morningstar at Udylite today.
Lee Morningstar who personally supervises every single Project Alert Barrel order.
PROJECT ALERT
world's largest plating supplier
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detroit 11
on the west coast: L. H. Butcher Co.

Pressure-Sensitive Protective Paper

Tech-Industro Co., Dept. MF, 415 West Pike St., Philadelphia, 40, Pa.

Due to its special adhesive qualities and ease of applying, KB protective paper has practically universal applications. It is easily stripped off a standard 36" x 48" roll, and odd sizes are also available. Any type of finish can be fully protected.

Two types of protective paper are available KB1, which is non-stretchable; and KB2, a resilient, stretchable covering that has a latex adhesive. Application is extremely easy and simple.

The paper is smoothly applied without wrinkling and without bubbles. When removed, the paper leaves no stain or blemishes of any kind. If necessary for any reason, the paper can be temporarily removed and replaced without any harm to its protective qualities, which are known to be effective for six months.

The present material is white and can be written upon; printed rolls, however, will be supplied if required.

Portable Dust Collector

Cincinnati Fan and Ventilator Co., Dept. MF, 3560 Montgomery Road, Cincinnati 7, Ohio

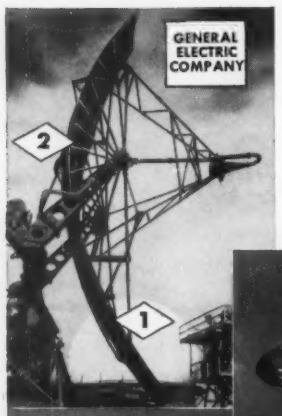
A double filter action which insures clean air return is a notable feature of a new dust collecting unit, the Dust-Master Model D-5. This self-contained, low-priced, portable unit also features no exposed moving parts and a spark-proof, cast aluminum fan. It operates on a permanently lubricated ball bear-

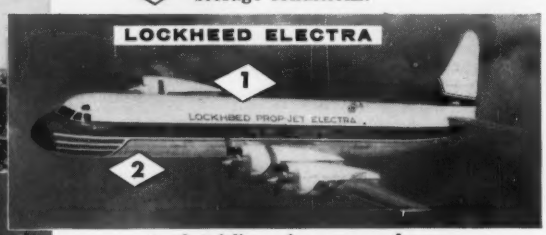
for protection on light metals

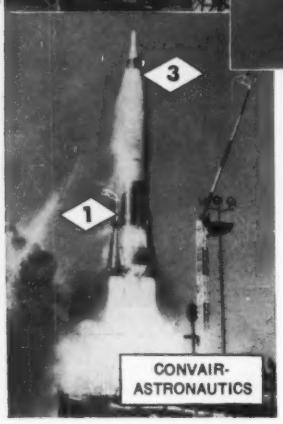
you need **IRIDITE®**

PROCESS ENGINEERED CHROMATE CONVERSION COATINGS

1. Iridite protects against high altitude weather extremes and against corrosion by hydrocarbon fuels, such as gasoline and kerosene.
2. Iridite provides a highly protective non-porous paint base.
3. Iridite protects against corrosive storage conditions.







And, Iridite gives you these additional advantages:

ON ALUMINUM—needs only normal precleaning. Film withstands cold forming or bending. Easily heliarc welded. Unusually low electrical resistance. Clear, yellow or dye-colored finishes.

ON MAGNESIUM—short immersion, room temperature solution, no electrical equipment. Corrosion protection relatively unaffected by high drying temperatures. Applicable to all alloys. Low electrical resistance. Color ranges from light gray to dark brown.

IRIDITE—a specialized line of chromate conversion coatings for non-ferrous metals. Easily applied at room temperatures with short immersion, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel; special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILES.

Iridite is approved under government and industrial specifications.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: I. H. Butcher Co.
European Agent: Stora Grenberger, Storgatan 10, Stockholm, Sweden
Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

ing, continuous duty ½-horsepower motor.

The unit employs a powerful, non-overloading type suction blower which draws dust and chip laden air into the cabinet through a hose connected to a hood over the dust-producing machinery. Fine dust particles are trapped in fireproof, washable filters. Extremely fine particles are caught by a cloth after-cleaner. The clean air then can be either returned into the room or vented. For cleaning, a front access door makes removal of the dust pan and filters easy.

Dust and mist collectors of special sizes and capacities to fit on or inside machines are also available from this manufacturer.

Paint Primer

Harrington Paint Co., Inc., Dept. MF, 1645 Collamer Ave., East Cleveland 10, Ohio

Clo-Flex 621 is said to provide uniquely complete coverage of all metal surfaces, particularly over weldments, sharp edges and other protuberances, utilizing a unique molecular hydrocarbon structure which is said to be compatible with practically all finish coatings. Compared to other primer coatings, it is claimed to be more impervious to salt and chemical attack, and more abrasion and chip resistant.

The primer dries to a tack-free finish in 15 minutes under average ambient temperature and humidity conditions, and can be force dried in 3 to 5 minutes.

The new material is said to have an indefinite pot life, is suitable for primer uses on most metals.

Plating Stop-Off

Fidelity Chemical Products Corp., Dept. MF, 470 Frelinghuysen Ave., Newark 12, N. J.

Dip-Pak #637 is a crystal clear plastic that leaves no film of any type on metal when stripped away. It is suggested for use primarily as a stop-off during electroplating or painting operations. Since it exudes no oil when left standing at room temperature, it is ideal as a semi-permanent coating or a temporary protective coating to protect metals against corrosion. Its base plastic is cellulose acetate butyrate, which is clear in color and extremely resistant to darkening under heat. The formulation melts at 360°F. in melting pot and may be used at 320° to 350°F.

Materials are shipped as solid plastic blocks and melted in an electric or oil jacketed pot just before application. The part is then dipped into the molten plastic, withdrawn, and allowed to cool. After shipment, storage, or processing, the coating may be removed easily by slitting with a sharp blade and peeling. Peeled material is reusable.

Airless Spray Coating Pump

Aro Equip. Corp., Dept. MF, Bryan, Ohio

A new line of airless spray coating pumps, designed for industrial production line coating applications and for wide-area coverage, supplies coating materials to spray guns at a hydraulic pressure estimated at twenty times the air supply pressure, and is claimed to virtually eliminate fog and

which stack would YOU use for corrosive fumes?
8888-CC
This stainless steel stack failed after only 6 months in corrosion service!
Over 2 years old . . . yet this Duracor stack shows absolutely no signs of attack inside or outside!

DURACOR VENTILATING SYSTEMS PROVIDE LASTING CORROSION RESISTANCE AT LOW COST!

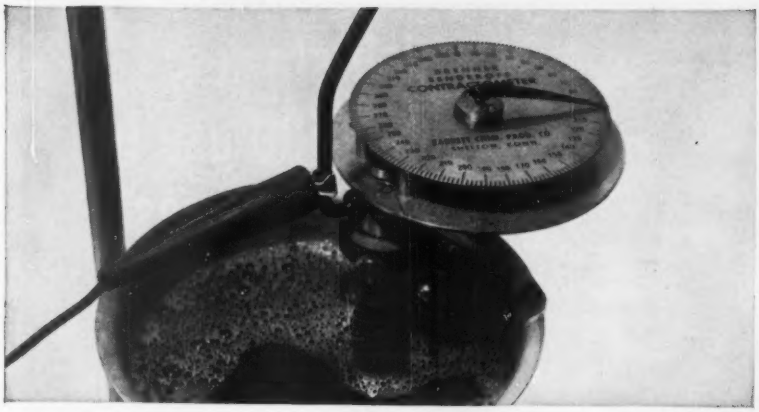
Performance-proven Duracor Ventilating Systems and components provide outstanding resistance to attack from all types of corrosive fumes. These high-strength systems are corrosion-proof throughout . . . are practically immune to weathering . . . require only minimum support! Best of all, Duracor construction can save you up to 30% on your initial investment . . . and it's maintenance-free! Ceilcote engineers will design a complete Duracor system to meet your special requirements . . . or modify your present system to permit gradual conversion to Duracor. Fabricated to meet customer specifications . . . or assembled from stocked component parts . . . Duracor Ventilating Systems can be easily installed by regular plant maintenance crews or by experienced Ceilcote installation personnel. Write today for the new Ceilcote catalog.

DURACOR CEILCOTE

ANOTHER PRODUCT OF

THE CEILCOTE COMPANY, INCORPORATED

4844 Ridge Road • Cleveland 9, Ohio



YOUR STRESS PROBLEM IS SOLVED!

. . . when you use the BARRETT SULFAMATE NICKEL PLATING PROCESS, the only nickel plating process which is essentially stress free as measured by the contractometer. Only BARRETT SULFAMATE NICKEL eliminates peeling, cracking, warping, blistering, distortion, shrinkage and premature fatigue failure of the base metal when due to high tensile stress. Complementing this major advantage, the BARRETT SULFAMATE NICKEL PLATING PROCESS also has superior throwing power and ductility, in a plating solution that arrives at your plant "ready-to-operate." Further technical data available upon request for bulletin SN-1. Stress measuring contractometer also available.

BARRETT
chemical products company, inc.
Shelton • Connecticut

overspray since the coating material "floats to the work surface."

Due to elimination of overspray, savings in paint up to 50 per cent have been reported. In addition, the new unit minimizes the need for exhaust equipment, drop cloths, and masking, according to the manufacturer. Another advantage claimed for the process is a substantial reduction in the number of applications required to protect the area being sprayed.

Ultrasonic Cleaning Unit

L & R Mfg. Co., Dept. MF, 577 Elm St., Kearny, N. J.

Two one-quart tanks are built into the generator body of the Ultra-Cleen '320', enabling a newly-designed electronic circuit to transmit ultrasonic power directly from the generator to the transducerized tank. The second tank is for the rinse operation. The

unit has been designed to clean at high speeds, with a minimum of attention. A new electrical timer controls the cleaning cycle and turns off the current after a pre-specified period.

Streamlined and simplified, the unit has an ultrasonic generator, one transducerized cleaning tank, one rinse tank and two covers within overall dimensions of 14¾" by 9" by 10½". The dimensions of each tank are 5½" square by 3" deep to accommodate a larger volume of larger pieces. Total weight is 23½ pounds.

Operating frequency is 70-80 KC; power consumed is 160 watts; power output is 55 watts. The unit is fully guaranteed for one year.

Anodize Thickness Tester

J. R. Engineering Co., Dept. MF, P.O. Box 343, Wausau, Wis.

For testing the thickness of anodized aluminum surfaces, a low cost precision built electronic instrument, tradenamed "Anotron", is a portable unit with self-contained battery, weight approx. 5 pounds, with direct reading dial. It provides a fast test, in less than one minute.

Wide Angle Spray Nozzle

Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.

A new spray nozzle, providing a full square spray pattern and extremely wide angle projection, is claimed to be the first wide angle spray nozzle developed with a square spray pattern. It is designed for installation on spray manifolds where open area is dimensionally limited. The average spray angle of 110° provides wide coverage within a short distance between spray nozzle and work. The square spray pattern on manifold, multiple nozzle

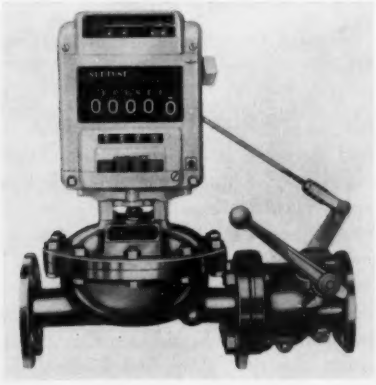
installations, permits keeping spray overlap to a minimum while still providing total coverage. Nozzles are supplied in capacities ranging from 5.9 to 48 gallons per minute at 30 psi, in choice of male and female pipe connections.

Liquid Meter

Neptune Meter Co., Dept. MF, 19 West 50th St., New York 20, N. Y.

This new 1½" stainless steel Auto-Stop Meter now provides automatic controlled measurement of predetermined quantities for batching and processing systems where corrosive liquids, such as acids and alkalies, are used. The meter functions almost automatically. All the operator has to do is press buttons on the register face to set the quantity and open the valve. The liquid flows unattended until the preset quantity is reached; then the valve cuts off flow automatically. During delivery, the operator is free to devote his attention to other details.

The meter has a capacity range from 20 gpm minimum to 100 gpm maximum, and is available in a choice of models for every application. Units can be furnished with Auto-Switch control feature, Repeating Auto-Stop, ticket printer, or any combination of these features in addition to the Auto-Stop. Meters can be calibrated for U. S. or Imperial gallons, liters or pounds. Once set, the positive-locking calibration adjustment mechanism cannot slip or drift. If changes or corrections are required, they can quickly be made by a patented gear shifter.



Air-Driven Sander

National-Detroit, Inc., Dept. MF, 2810 Auburn St., Rockford, Ill.

Finish sanding previously done by hand in the metal fabricating industry can now be handled quickly and efficiently by the Model "DA" air-driven sanding machine.

Dual action produces a scratch free finish because the abrasives are traveling in a non-directional pattern. It is simple to remove sags or scratches without going through the undercoat. Primer, putty and surfacer can be sanded dry without loading the abrasive, using grits ranging from #180 to as fine as #320. The abrasive grains travel in a non-repeating path which

1.7 ∧ 3.0 microns:
THERM-X-RED†
IMMERSION HEATERS
Featuring
VAPO-VENT†
VAPOR and LIQUID
TIGHT VENTING ASSEMBLY
ON ALL QUARTZ HEATERS
and
NEO-TITE†
VAPOR and LIQUID
TIGHT ASSEMBLY
ON ALL METAL HEATERS
Presenting The NEW REPLACEABLE HEATING ELEMENT
THERM-X-RED, a superior line of immersion heaters, presented by N.J. THERMEX, introduces a new innovation of vapor venting to eliminate internal explosion in Quartz heaters. The VAPO-VENT assembly provides a venting system for expanding gases, a completely liquid sealed head assembly and an extremely versatile unit which permits field repair with standard replacement. These exclusive THERM-X-RED features are further aided by the NEO-TITE vapor and liquid tight assembly which protects the heating elements in both Quartz and Steel units. Here at last, is a thoroughly versatile unit permitting ever accidental total immersion in highly corrosive chemicals with no harm to the equipment.
These and many more features are fully detailed in our latest catalog available on request. Models in standard, thermostatic and remote control thermostatic units are available in Steel, Stainless Steel and Quartz construction.
*ON QUARTZ HEATERS
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N. J. THERMEX COMPANY, INC.
Choice territories open for sales representation. Write for details.
535 - 533 BERGEN ST., HARRISON, N. J.

MURRAY-WAY SPECIALIZED FINISHING EQUIPMENT
JUNIOR FLAT POLISHER— versatile production unit for economically grinding, polishing, or deburring flat surfaces.
HORIZONTAL-PLATEN CONVEYOR built to fit your exact requirements.
POLISHING AND BUFFING TABLE— small dial table has abrasive belt head and buffing head for spiral aluminum shapes
ECONOMICAL LATHE— stripped of many unnecessary "frills" to keep costs to a minimum.
ROLLER COATER— a trouble-free, precision unit that coats one or both sides of a sheet.
...IMPROVES QUALITY, REDUCES COSTS FOR METAL PRODUCTS MANUFACTURERS
Polishing, buffing, grinding, filtering, deburring, materials handling . . . whatever your problem, Murray-Way equipment will do the job better and more economically. Fresh ideas based on a solid background of experience, enable Murray-Way's fine engineering and production departments to handle any and all of your production problems— large or small. The BETTER WAY is the MURRAY-WAY.
HAN-D-MATIC— low cost machine with interchangeable components for buffing, grinding, and deburring.
WIRE BRUSH MACHINE— deburrs automatic washer and dryer basket holes prior to painting.
MURRAY WAY
MURRAY-WAY CORPORATION
P.O. BOX 180 • MAPLE RD. EAST
BIRMINGHAM, MICH.

does not generate heat on the surface and soften the paint.

Manufacturers' Literature

Polishing Zinc

Lea Manufacturing Co., Dept. MF, 16 Cherry Ave., Waterbury 20, Conn.

A new technical data sheet, covering the abrasive finishing of die cast and rolled zinc, gives such data as polishing wheel speeds, type of buff and recommended abrasive compound. Hand and automatic set-ups using both bar and liquid compounds are covered.

Cleaning Aluminum

Frederick Gumm Chem. Co., Dept. MF, 538 Forest St., Kearny, N. J.

Even-Etch process, which cleans wrought or extruded aluminum, removes all micro-corrosion and imparts to the surface a smooth silvery appearance, is described in a new technical bulletin.

Buff Wear Compensator

Packer Machine Co., Dept. MF, 456 Center St., Meriden, Conn.

This literature, consisting of a 8½" by 11" two-color printed sheet, describes the full operation of the Adjusta-Matic electronic adjustment device, and photographically illustrates wheel or buff compensating motion, vertical and horizontal motion.

Chemicals and Equipment

Hampden Chemical & Equipment Co., Dept. MF, 2751 E. Juniata St., Philadelphia 37, Pa.

A four page bulletin is available on the more than 300 plating supplies and heavy chemicals carried by the above firm. Listed are such items as plating process chemicals, polishing room supplies, metal finishing equipment, and laboratory equipment.

Chrome Reducer

MacDermid, Inc., Dept. MF, Waterbury, Conn.

Metex Chrome Reducer M-623, for use in alkali cleaners and copper plating solutions, is fully described in Technical Data Sheet No. 110, a two-page usage and instruction sheet.

Water Emulsion Paints

Eagle-Picher Co., Chemicals and Metals Div., Dept. MF, Cincinnati 1, Ohio

One of the features of this new brochure are actual color pictures of exposure tests showing surfaces protected with paints formulated with and without zinc oxide. Also included in the brochure are recommended formulations developed by the firm's research technicians.

Spray Painting Machine

Conforming Matrix Corp., Dept. MF, 349 Toledo Factories Bldg., Toledo 2, Ohio

A new brochure has just been issued on a pressure contact spray painting machine, Model EPC 20, that incorporates new features including enlarged plenum chamber, accurate variable speed oscillation, air filter, automatic trap, and adjustable spraying time.

Rotary Pumps

Deming Company, Dept. MF, Salem, Ohio

A new rotary pump selection manual takes technical data, simplifies it, and presents it in an easy-to-understand way. Liquids are grouped into eight classifications according to viscosity, and each classification has its own selection table.

When a user, distributor or engineer knows the type of liquid to be pumped, or a liquid similar to it, using the new simplified method, he

can consult the tables in the bulletin and make his selection, eliminating all the mystery previously associated with rotary pump selection. The tables of selection cover most all liquids from alcohol to heavy asphalts.

Barrel Finishing and Abrasive Blasting

Lord Chem. Corp., Dept. MF, 2068 South Queen St., York, Pa.

Concise, complete coverage of precision finishing equipment, supplies, and accessories is provided in two new bulletins.

Photographs and explanatory text cover Lorco vibratory finishing equipment, Techline barrel finishing equipment, Techline Liquamatte wet blast equipment, media, compounds and abrasives, and auxiliary finishing equipment, such as media pans, storage bins, magnetic and mechanical separators, dip and rinse tanks, and degreasers.

Water and Waste Treatment

Graver Water Conditioning Co., Dept. MF, 216 W. 14 St., New York 11, N. Y.

Methods and equipment for treating metal finishing process water and wastes are covered in Technical Reprint T-180, a complete review of the subject. It discusses reasons for treatment; how to investigate the problem; modern treatment methods available for hexavalent chromium, cyanides, acids and alkalies, oily wastes and process water.

The article goes on to consider recovery versus disposal, instrumentation of water treatment plants for ease of operation, and the use of the new Hi-Sep dialysis system for the recovery of valuable products.

Infrared Sections

Fostoria Corp., Infrared Div., Dept. MF, Fostoria, Ohio

Catalog 103, 2 pages, gives full information on low-cost infrared do-it-yourself oven components incorporating G-30 type infrared lamps.

High Temperature Coatings

Dampney Company, Dept. MF, Hyde Park, Boston 36, Mass.

A new bulletin describes high-temperature silicone and silicone-ceramic coatings for maintenance painting and industrial finishing.

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of Modern Cleaning and Finishing Methods.

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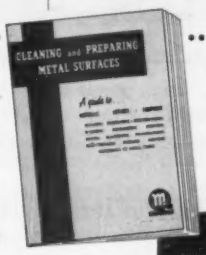
28 PAGE GUIDE
TO MODERN
METAL-CLEANING
METHODS.



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Company_____
Position_____
Address_____
City_____ State_____

magnus CHEMICAL COMPANY INC

A WORLD-WIDE ORGANIZATION SPECIALIZING IN THE CLEANING AND PROTECTION OF ALL SURFACES.

Epoxy-Tar Coatings

Carboline Co., Dept. MF, St. Louis 17, Mo.

New four page Bulletin 803, on Carbomastic epoxy-tar protective coatings, explains an entirely new approach to coating protection.

Separating Equipment

Techline Div., Wheelabrator Corp., Dept. MF, 2068 S. Queen St., York, Pa.

Four-page bulletin 402 describes a complete line of magnetic and mechanical separating equipment that enables greater efficiency in separating parts from media and grading various sizes of barrel finishing media. Capacities, specifications, and operating features of the four models of separating equipment available are described in the bulletin.

Wood Grain Printer

M-H Standard Corp., Dept. MF, 515 Communipaw Ave., Jersey City 4, N. J.

A four page bulletin, No. 1401, illustrates and describes four models of the above firm's wood grain printer. Advantages of the machine are given, also which surfaces it will print on, in which colors and on which wood grain.

Rust Preventives

Techline Div., Wheelabrator Corp., Dept. MF, 2068 S. Queen St., York, Pa.

Bulletin 1001 describes the physical

- Carefully-controlled standards of purity and uniformity
- Orders filled promptly
- Material easy to handle in sacks and fiberboard drums

PHELPS DODGE REFINING CORP.
300 PARK AVENUE, NEW YORK 22, N. Y.

properties and applications of four Anarust types. Also illustrated are results of controlled laboratory tests of corrosion protection offered in varying concentrations in solution.

Barrel Finishing Media

Lord Chemical Corp., Dept. MF, 2068 S. Queen St., York, Pa.

In Bulletin No. 900 on Lorco Jetforms, new barrel finishing media, complete, concise information presented on the random-shape forms is augmented by photographs of the media. The bulletin also contains a table of 16 screen mesh sizes and illustrates case histories of results achieved in actual commercial barrel finishing processing.

Mechanical Deburring

Wheelabrator Corp., Dept. MF, 1150 S. Byrkit St., Mishawaka, Ind.

A new four-page, fully-illustrated folder details four methods of mechanical deburring. The literature describes and diagrams the methods, and gives numerous examples of application.

Metal Cleaner

Metasurf Corp., Dept. MF, 12830 Eaton Ave., Detroit 27, Mich.

A brochure is available on Metaclean No. 268, a non-corrosive alkaline cleaner, which lists six advantages of the product, and operations for which it has proved particularly effective.

BUSINESS ITEMS

MacDermid Inc. Appoints Consultant

Samuel Wein

Appointment of *Samuel Wein* as consultant in the field of electroless plating and printed circuitry has been announced by *MacDermid Inc.*, Waterbury, Conn., manufacturer of metal finishing chemicals.

Mr. Wein, long eminent in this field, is perhaps best known for pioneering the photo-electric effects of the metals, and rectification of A.C. to D.C. of the metals and corresponding sulphides. He is accredited with more than one hundred patents, dealing chiefly with electronics, plastics, photography, chemistry and the associated arts.

Noted also as a writer and lecturer, Mr. Wein has authored numerous articles, scientific papers and other technical literature, notable among which are "Metalizing Non-Conductors" and "Metallic Coatings on Non-Metallic Materials." The former work is considered the 'Bible' of metalizing; the latter was published by the U. S. Commerce Department's Office of Technical Services.

Brucar in New Location

Brucar Equipment and Supply Co., Inc. is pleased to announce the removal of its office and warehouse to new and larger quarters at 2740-2742 Grand Ave., Bellmore, L. I., N. Y.

With the additional space, the firm will be better equipped to store, rebuild and distribute metal finishing equipment and supplies.

Precious Metals Refining Corp. Formed by Sel-Rex Principals

The formation of *Precious Metals Refining Corp.* by the principals of *Sel-Rex Corp.*, Nutley, N. J., has been announced recently. The new company has been situated in a separate building encompassing nearly 10,000 square feet, immediately adjacent to the firm's executive offices.

Staffed by precious metal refining specialists with an aggregate experience of more than half a century, the new company is said to be equipped with custom-designed scientific equipment for quick processing with greatest possible yields.

A brochure listing details of the refining service, as well as a precious metals refining schedule of prices, has been prepared and may be requested directly from the company at 85 River Road, Nutley 10, N. J.

Kocour Represents Riegel

The Bias Buff and Wheel Division of *Riegel Textile Corp.* has announced the appointment of *Kocour Company*, 4800 S. St. Louis Ave., Chicago 32, Ill., as a representative in the states of Illinois and Wisconsin. The new representative will enable Riegel to service accounts in these two states far better than previously.

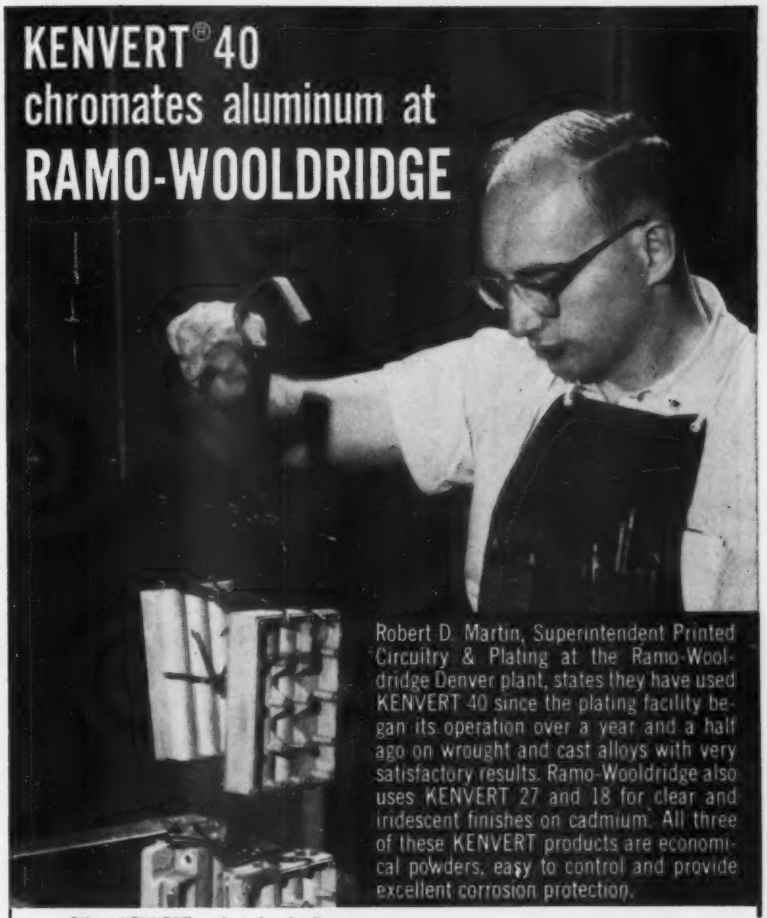
Elliott Joins Enthone, Inc.

Edwin C. Elliott has joined *Enthone, Inc.* of New Haven, Conn., as a sales engineer. He will cover Rochester-Syracuse-Utica area of central New York State.

Mr. Elliott has studied at Union College and the University of Rochester. He has had over twenty years experience in metal finishing as plating chemist, plating foreman and, most recently, as a senior sales engineer for Frederic B. Stevens, Inc. He is a vice-president of the Syracuse Branch of the A.E.S.

Edwin C. Elliott

KENVERT® 40
chromates aluminum at
RAMO-WOOLDRIDGE



Robert D. Martin, Superintendent Printed Circuitry & Plating at the Ramo-Wooldridge Denver plant, states they have used KENVERT 40 since the plating facility began its operation over a year and a half ago on wrought and cast alloys with very satisfactory results. Ramo-Wooldridge also uses KENVERT 27 and 18 for clear and iridescent finishes on cadmium. All three of these KENVERT products are economical powders, easy to control and provide excellent corrosion protection.

Other KENVERT products for aluminum:
KENVERT 45—non-fuming pickle for aluminum castings
KENVERT 46-EC—non-fuming aluminum bright dip additive
KENVERT SLUFF-OFF® X—buffing compound remover

CONVERSION CHEMICAL CORPORATION
100 E. Main Street, Rockville, Connecticut, Phone TRemont 5-3357
Licensees: Nicromatic Ltd., Toronto, Canada
Silvercrown Ltd., London E. C. 1, England

Belke Appoints Great Western Chemical Co.

Appointment of *Great Western Chem. Co.* as exclusive distributors in the eleven western states is announced by *Belke Mfg. Co.*, 947 N. Cicero, Chicago 51, Ill.

Great Western has warehouses at Spokane, Seattle, Portland, Richmond and Los Angeles with over 200,000 square feet of warehouse space and fifty trained salesmen covering all types of industry in the eleven western states. Its metal finishing department is headed by *Harold R. Smallman*. The Los Angeles operation is managed by *W. A. Nairne*. Both these executives were formerly associated with Hanson-Van Winkle-Munning Co. and have had long experience in the metal finishing industry.

Free Course in Electroplating

The course of study in electroplating given at the Fort Greene Evening High School, 29 Fort Greene Place, Brooklyn, N. Y. (formerly Brooklyn Evening Technical High School) will begin its Fall term on September 15, 1960.

The session is divided into classroom discussion and laboratory experiments. The classroom topics will include simple calculation, reading graphs, chemistry of the plating tank, pH, wetting

PURE WATER FOR RINSING AND PLATING SOLUTIONS... *AUTOMATICALLY!*

The IonXchanger shown here processes any supply water to an extremely high degree of purity — and *regenerates itself automatically* at established intervals of flow or time. For all types and sizes of plating firms or departments it is a money-making investment available at a cost within reason. Reliability of performance has been proved in scores of successful installations. *Ask your IWT representative for details.*

ILLCO-WAY ionXchange

NOTE

Illinois Water Treatment Company has pioneered in the development of processes and equipment for recovery of plating, stripping, and bright dip solutions, and of valuable metals in waste waters.

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST,, ROCKFORD, ILLINOIS
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.

agents, pitting, deionizing. The laboratory experiments will include solution analysis, Hull cell studies, anodizing.

Registration begins September 12, 1960, and daily thereafter from 7:00 to 8:30 P.M. Classes will meet on Tuesday and Thursday from 6:45 to 8:15 P.M., including about 6 Fridays. The term begins September 15 and ends January 31, 1961. Register with *Mr. L. Serota* in Room BW17 or 3E12.

Midland Industrial Finishes Co. Promotes Executives

Midland Industrial Finishes Co., Waukegan, Ill., announces promotions for two executives, *Edward J. Bromstead* to supervisor, Metal Decorating Laboratories Division, and *Richard E. Caplan* to supervisor of the firm's product development laboratories.

Edward J. Bromstead

Mr. Bromstead, Canadian born, majored in chemistry at Marquette University and joined the company in 1943 as a chemist. He is a member of Chicago Society for Paint Technology, having served on several of its technical committees, and has contributed many papers on various technical phases of organic industrial coatings.

Richard E. Caplan

Mr. Caplan is a graduate of Western Illinois University where he majored in chemistry, joining the firm in 1954. In 1958, he was made assistant to the technical director, remaining in this capacity until being promoted to his new position. Mr. Caplan is a member of the Chicago Society for Paint Technology and of the Forest Products Association.

Herring Promoted at H-VW-M

Hanson-Van Winkle-Munning Co. has announced the appointment of *Glenn M. Herring* as assistant to the vice-president—sales. In his new capacity, Mr. Herring will assist in general sales management under *R. M. Norton*, vice-president—sales. He will continue in the management of the Eastern sales district, with headquarters at Matawan.

Mr. Herring joined the firm's sales force in 1930 as a trainee. He was appointed sales representative to the Pittsburgh area upon completion of this course. In 1955 he transferred to home office in Matawan and was appointed manager of steel mill sales. Three years later he was appointed to the post of district manager—Eastern states (New Hampshire to Florida).

Mr. Herring, a graduate of Lafayette

Glenn M. Herring

College, received his B.S. in 1930. He is an active member of the American Electroplaters' Society, Association of Iron and Steel Engineers and the University Club of Pittsburgh, Pennsylvania.

New Company Formed by Acme

A new company, named *Acme-Efco Ltd.*, has been formed to market the complete line of Acme polishing and buffing machines. It is owned jointly by *Acme Mfg. Co.*, of Detroit, Mich., leading manufacturers of automatic buffing and polishing machines for over 50 years; and *Electro-Chemical Engineering Co., Ltd.* of Sheerwater, Woking, Surrey, one of the leading automatic electroplating equipment manufacturers and plating process development companies in England for more than 21 years.

The new company has been established to manufacture and sell to the English industrial and metalworking market the complete line of machines, and is the second European company formed by Acme in the last 5 years.

Zievers Elected President of Foreign Sales Div. of Industrial Filter & Pump Mfg. Co.

James Zievers of La Grange, Ill., has been elected president of the Foreign Sales Division of *Industrial Filter & Pump Mfg. Co.*, Cicero, Ill. He is vice-president and general sales manager of the company and has served in various sales and executive capacities during the past ten years.

Mr. Zievers is a graduate of Kings Point Merchant Marine Academy,

Here's the
PHOSPHATE COATING
You asked TURCO TO MAKE

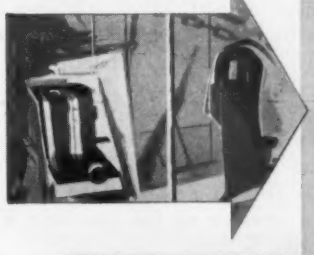
HERE'S HOW PAINTITE® SCORES ON SURVEY'S 12 "MOST WANTED" FEATURES...

–Formulated as Result of Industry-Wide Survey...

During the first six months of 1959, Turco undertook an extensive survey of the phosphate coating market. Hundreds of users of these coatings were interviewed. Thousands of questions were asked. When the answers were tabulated, Turco began the task of building an iron phosphate process to the *exact specifications* called out in the survey.

The new process is now available. It is called Turco Paintite. Paintite has been thoroughly field-tested in the production lines of a dozen Turco customers. It has passed the most severe tests with flying colors. Turco is proud to announce the addition of Paintite to its ten other Turcoat phosphate and conversion coating processes that provide a better bond for organic finishing.

1. **SUPERIOR CLEANING**–Exclusive wetting system provides heavy-duty uniform cleaning. Cleans & phosphates simultaneously.
2. **TEMPERATURE VERSATILITY** – Efficient anywhere within range of 140° to 180°F. Temperature control is not important.
3. **LOW FOAMING** – at any temperature within recommended range.
4. **LESS POST RUST**–Eliminates post rusting problem often encountered with iron phosphate processes.
5. **NO WHITE STREAKING**–Extra free rinsing. Leaves no residue.
6. **ECONOMICAL**–Low in initial cost. Low in maintenance cost. Low in cost per sq. ft. Long-lived, even under mass production use.
7. **UNIFORM COATING**–even on edges and points. Won't show through on low-pigmented paints.
8. **USE VERSATILITY**–used by immersion, spray washer or steam cleaner.
9. **LESS SLUDGE** – less scale. Minimizes clean-up problems.
10. **RESERVE ACIDITY**–combats alkaline water conditions. Constant control not necessary.
11. **SUPERIOR SERVICE**–by Turco's vast network of technically trained servicemen, located in industrial centers throughout the world.
12. **REQUIRES ONLY 3 STAGES**–for dip or spray washing. Can be efficiently used in 5-stage operations, if desired.



FREE! VALUABLE BOOKLET PHOSPHATING REFERENCE CHART TECHNICAL DATA BULLETIN

Get the full story on Paintite and the other ten phosphating and conversion coating processes in the complete Turcoat line. Write for your copy, along with Turco's Phosphating Reference Chart, today!

TURCO PRODUCTS, INC.
24600 South Main Street, Wilmington, California
Chemical Processing Compounds
FACTORIES: Rockdale, Ill., Houston, Wilmington, London, Rotterdam, Sydney, Mexico City, Paris, Hamburg, Montreal, Manila, Naha (Okinawa)
Offices in All Principal Cities

TURCO PRODUCTS, INC.
24600 South Main St., Wilmington, Calif.
MERELY AFFIX COUPON TO COMPANY LETTERHEAD
Please send valuable booklet with Phosphating Reference Chart and full details on Paintite. I understand there is no cost or obligation on my part.
NAME
TITLE
MF

James F. Zievers

Ripon College and Northwestern University and holds a master of arts degree from the latter institution, attained in the fields of economics and international trade. He is a member in good standings of American Society of Chemical Engineers, American Economic Association, American Statistical Society, Western Society of Engineers, and International Society of Cane Sugar Technologists.

Heil Appoints Protiva Plant Manager

R. F. Protiva has been named manager of the Cleveland plant of *Heil Process Equipment Corp.*, in charge of all manufacturing, estimating, and product promotion of the company's

Deering, Milliken

RESEARCH
AND
CONTROL

From cotton...
to yarn...
to cloth...
to buff...

RESULTS IN SUPERIOR BUFF CLOTHS

The Long
and the Short of It!

Staple means length when discussing cotton fiber...and staple is a mighty important factor in making buff cloth. After having selected the areas—even the plantations—from which the cotton for Milliken is to come, an important control is in checking the staple or length of the fiber...and strangely enough in this day of modernization, this checking is best done by hand. It takes four years to train a 'classer' as he is called. But once he learns how to make this intricate test, he is astonishingly accurate. Even if the cotton fibers get his approval, there's more checking and testing...all aiming to provide the users of buffs with the best buff fabrics that can be made.

So much for another important Milliken Control Check. On the opposite page, some of the results of this painstaking control may suggest to you that you, too, should investigate the merits of buffs made of Milliken cloth. Your supplier will get them for you.

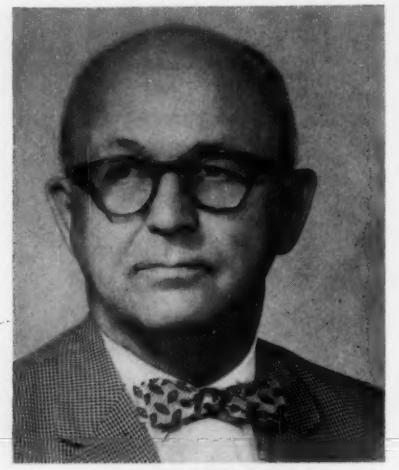
Have you read the Story of Deering, Milliken Research and its part in the development of the line of Milliken Buff Cloths? If not, let us know and we'll be glad to send you a copy. You will find it both interesting and informative.

ENGINEERED
BUFF FABRICS
by *Milliken*

REDLINE
WEARON
TYPE 190
TYPE 160

DEERING, MILLIKEN
& CO., INC.
1045 SIXTH AVENUE • NEW YORK 18, N.Y.

R. F. Protiva



H. Leslie Ferguson

line of chemical resistant process equipment.

Protiva joined the company as sales engineer in 1940, following his graduation from Case Institute of Technology with a degree in Metallurgical Engineering. He became manager of process industry sales in 1956, eastern sales manager in 1957 and manager of market development in 1959. Protiva is a Registered Professional Engineer, and a member of the Cleveland Engineering Society.

Heatbath Corp. Personnel Changes

Kenneth J. Cave has been appointed technical sales representative by *Heatbath Corp.* for the Southern Ohio and West Virginia territory. He is a graduate of Notre Dame University and previously was associated with Oakite Products. He will have headquarters in Columbus, Ohio.

The company also announces the transfer of *Pete Petroff* to the home office in Springfield, Mass., where he will assume new duties as Eastern district sales supervisor.

Sel-Rex Appoints Ferguson Service Engineer

H. Leslie Ferguson, with Technic, Inc. for the past six years, has joined *Sel-Rex Corp.* as resident service engineer for the New England states.

A chemistry major at Bowdoin College, Mr. Ferguson was a science teacher early in his career. Self-employed as a plating consultant to the jewelry manufacturing industry for over five years, he is considered to be an authority on the solution of problems connected with precious metals electroplating. In addition to his consulting work, Mr. Ferguson also gained first-hand knowledge of jewelry manufacturing as plating foreman with two of the most highly regarded names in the industry — Anson, Inc. and Coro, Inc.

Mr. Ferguson has been an active member of the A.E.S. for over 15 years, and served as president of the Providence-Attleboro Branch during 1958-1960. He is also credited with being one of the originators of the Jewelry Industry Seminar sponsored by that branch.

As soon as he has completed an intensive indoctrination period at the firm's Nutley, N. J. laboratories, Mr. Ferguson will make his headquarters at the New England offices located at 915 Industrial Bank Bldg., Providence, R. I.

Enthone Expands Warehousing in New York State

Enthone, Inc. of New Haven, Conn., has doubled its warehousing facilities in New York State with the establishment of a complete stock of chemicals at 921 North State St. in Syracuse, to serve the Rochster-Syracuse-Utica area. *Edwin C. Elliott,* who recently joined the firm as sales engineer, will supervise warehousing in Syracuse.

Plating equipment and accessories manufactured by the company will continue to be shipped from New Haven.

New Appointments for Hooker's Eastern Chemical Div.

John M. Glaze has been promoted to supervisor — organic chemicals of the Eastern Chemical Division, *Hooker Chemical Corp.* He will be located at division headquarters in Niagara Falls,

reporting to *William L. Gillespie*, product manager — organic chemicals.

A field salesman in the New York District since 1947, Mr. Glaze, a native of Niagara Falls, N. Y., majored in chemistry at Dartmouth College. He was employed at the company's Niagara Falls plant from 1942 to 1947, as a foreman in the research department for four years and as a purchasing department expeditor for one year. Succeeding Mr. Glaze in the New York District is *Robert W. Roach*, who has been in sales training since last August.

Mr. Glaze is a member of the American Chemical Society, a director and past chairman of admissions of the Salesmen's Association of the American Chemical Industry, Inc., and treasurer of The Racemics.

New Infilco Agent Appointed for British Columbia

Infilco Inc. of Tucson, Ariz., announces the appointment of *Robert R. Alpen Industrial Equipment Ltd.*, 560 Stevens Drive, West Vancouver, B.C., as the company's agent in British Columbia. *Robert Alpen*, president, will take personal charge of operations in the area.

Kern Elected V.P. of Electrolizing Corp. of Ohio

J. E. Kern, general manager of the *Electrolizing Corp. of Ohio*, was elected vice-president at a recent meeting of the board of directors.

Mr. Kern is well-known in the field of bearing surface applications, with 12 years of experience as design engineer in the development of bearing coatings at Cleveland Graphite Bronze Co. He previously served as general manager of Tipp Mfg. Co., Tipp City, Ohio.

Diamond Alkali to Expand

Plans to initiate a long-range expansion program at the Belle, W. Va., plant of the Chlorinated Products Division of *Diamond Alkali Co.*, Cleveland, Ohio, were announced recently. Initial work will include the erection of new buildings and the replacement of operating equipment to take advantage of recent process improvements.

Modernization of facilities for the production of methyl chloride, methylene chloride, and chlorofrom will result from this initial program which is being started immediately.

Acoustica Inaugurates Marketing and Engineering Division

Acoustica Associates, Inc., with main offices and plants in Los Angeles, Calif., has opened the headquarters of its new eastern marketing and engineering division at 600 Old Country Road, Garden City, N. Y. The new division will provide additional marketing services and engineering data for customers located east of the Mississippi River.

Personnel appointed to the new headquarters include *Maurice Howell*, eastern regional cleaning system sales manager, and *Arthur Liers*, eastern service manager.

Detrex Promotes Three

Detrex Chemical Industries, Inc., manufacturers of cleaning and metal processing chemicals and equipment for industry, announces the promotion of three executives to key management positions.

E. W. Allison has been elected vice-

J. E. Kern

E. W. Allison

Buff Values resulting from

Deering, Milliken

Research and Control

Competitively Superior Job being done by

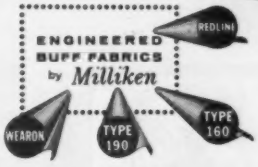
Wearon®

Article.....aluminum eyeglass temples
Operation.....hand buffing
Buff..8"x50ply, 1 row sewing, full disc

As a result of extensive tests, the above company reports that WEARON did a much better job...so much better, as a matter of fact, that the company changed its specifications to WEARON for all its buffs on this class of work.

Practically every test made in the field on a great many articles indicates that WEARON is clearly a superior cloth for buffs for certain finishing requirements...a superiority that can be measured in dollars and cents savings. Cloth X will turn out so many pieces per buff —WEARON will turn out X + Y pieces. The value Y in terms of production is proving to be more than the small additional cost of WEARON. If you are concerned with your buffing costs, why not put a WEARON buff to work...on a strong competitive basis. If the unknown Y also exceeds the small cost differential, wouldn't it be smart to change to WEARON?

This 12-page brochure tells about our extensive research, testing and control facilities starting with the cotton fiber through to the finished cloth. Would you like a copy?



DEERING, MILLIKEN & CO., INC.
1045 SIXTH AVENUE · NEW YORK 18, N.Y.

G. C. Van de Riet

F. J. Chmielnicki

president, in charge of all sales and marketing functions of the company. He will relinquish his current assignment as secretary-treasurer which he has held for eleven years.

G. C. Van de Riet has been promoted to treasurer of the company, and he will continue his duties as controller — a post he has had for ten years.

F. J. Chmielnicki has been elevated to secretary of the company and legal counselor. Chmielnicki has been assistant secretary and legal counselor for the firm for the past ten years.

Fostoria Corp. Changes Sales Offices

Fostoria Corp. has announced the relocation of their Madison, N. J., sales office to 120 Morris Ave., Springfield, N. J.

The Chempump and Dynapump office formerly located in Schenectady has been relocated to 111 Devonshire Court, Rochester 11, N. Y. This office will continue under the direction of *Lee Heath* and will serve Western New York and the Erie, Pennsylvania, area.

Roto-Finish Appoints Mexican Licensee

Enthone de Mexico has entered into an agreement that makes the company exclusive Mexican licensee for Roto-Finish processes and materials, according to an announcement by *Roto-Finish Co.*, Kalamazoo, Mich.

Enthone de Mexico, a subsidiary of the American Smelting and Refining Co., has its offices, laboratory, and factory at Prolongacion De Pino 669, Mexico 15, D. F.

O'Donohue Sales Co. Changes Names

O'Donohue Sales Co., 3818 N. Hubbard St., Milwaukee, Wisc., announces a change in the company name to *O'Donohue Industries*, effective immediately. The firm distributes chemicals, equipment, and supplies to industrial and other commercial users.

Davies Appoints Ponticello to Sales Staff

Santo Ponticello has been appointed to the home office sales and engineering staff of *Davies Supply and Mfg. Co.*, St. Louis. He recently completed a six-month training course with Davies and *The Udylite Corp.*, which Davies represents in a nine-state area. He attended

Santo Ponticello

Syracuse University and is a Mechanical Engineering graduate of the University of Michigan. During three years in the Navy, he served as Engineering Officer aboard the destroyer, USS Fechteler.

Carus Chemical Co. Opens Laboratory

The *Carus Chemical Co., Inc.*, La Salle, Ill., sole American producer of potassium permanganate, announces the opening of its new end-use research laboratory to develop and evaluate processes using the company's products in the metal working, metal finishing fields.

Potassium permanganate is being used currently in conjunction with caustic soda to condition heat scale and smut on metal for removal by acid pickling acids, which tend to over-etch and pit base stock.

Schaffner
BRAND
NEW
S–500
STAINLESS STEEL BUFFING
... COMPOUND ...
AN IDEAL
ALL PURPOSE
CUT AND COLOR
COMPOUND.....
FOR STAINLESS STEELS
AND CHROMIUM...
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Request for SAMPLES
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IMMEDIATELY....
Schaffner
MANUFACTURING COMPANY, INC.
"Schaffner Bros. make things shine"
Bob — Paul — Gus
* TRIPOLI COMPOUNDS * CHROME COLORING ROUGE * GREEN ROUGE * JEWELERS' ROUGE
* CROCUS COMPOUND * STAINLESS STEEL COMPOUNDS * ALUMINUM BUFFING COMPOUNDS
* ALL-PURPOSE BUFFING COMPOUNDS * WHITE COLORING COMPOUNDS * NICKEL BUFFING (LIME) * EMERY CAKE * PLASTIC BUFFING COMPOUNDS * TALLOW GREASE STICK
* PUMICE GREASE STOCK * POLISHING WHEEL CEMENT * STEEL POLISHING COMPOUNDS
COMPOUNDS MADE IN BAR SPRAY OR PASTE

Tamms Appoints Thompson-Hayward

Tamms Industries Co., Chicago, has announced the appointment of the *Thompson-Hayward Chem. Co.* in Minneapolis, Kansas City, and Memphis as representatives for soft amorphous, crystalline, and diatomaceous silicas.

Como Named UPA Assistant Sales Manager

Sam S. Como has been appointed assistant sales manager at *Unit Process Assemblies, Inc.*, 53-15 37th Ave., Woodside 77, N. Y.

Mr. Como will be concerned with the sales administration of the company's non-destructive coating thickness tester and periodic reverse equipment. He has a background study of electrical

Sam S. Como

engineering at the Cooper Union Institute of Technology.

IFCO Sales Co. Formed

A new agency for the distribution of industrial coatings in the South and Southwest has been established in Houston by a well-known Texas engineering executive, *G. M. McGranahan*. The organization is *IFCO Sales Co.*, of which McGranahan is general manager. Associated with him in the business are his son, *J. G. McGranahan*, a chemical engineer; and *John H. Heidelbaugh*, formerly an industrial project engineer.

Ultrasonic Industries Inc. Unites Efforts with Danish Firm

Ultrasonic Industries, Inc., Albertson, N. Y., and *Industrikeme A/S*, Denmark's leading metal finishing equipment manufacturer, have consummated agreements for the mutual distribution of each company's products in their respective countries. Both companies will stock each other's equipment, permitting prompt delivery and superior service to customers despite the long line of supply. Also, there will be an interchange of engineering know-how in order to affect qualified sales engineering assistance to buyers of custom-built equipment.

Diamond Alkali Co. Appoints Robert G. Dow

Appointment of *Robert G. Dow* as a field salesman for the Chicago branch sales office of *Diamond Alkali Co.* was announced recently. He succeeds *H. T. Woollacott*, a 40-year company veteran who died March 31, 1960.

The new area representative brings a broad background of experience to his new post. During the summer months while attending high school and college he worked for various firms associated with the leather industry. After graduating from Tufts College, Medford, Mass. in 1951 with a B.S. degree in Chemistry, Dow spent four years as a technical sales and service representative in the leather industry field. He joined the firm in October 1955 as a technical serviceman in the company's research department, Painesville, O.

McClung Elected Vice President of Van Straaten Chemical Co.

Ernest E. McClung has been elected

Alexander Wilson

vice-president and consulting chemist of the *Van Straaten Chemical Co.*, Chicago. A registered professional engineer in the State of Illinois, he holds a B.S. in Ch.E. and the degree of Ch.E. from the Armour Institute of Technology.

Mr. McClung joined the firm 19 years ago in the chemistry department. For the 20 years prior to this he was assistant chief chemist, testing department, of the Illinois Central Railroad. McClung spent another five years in the testing department of the Chicago Rock Island and Pacific Railway.

Parker Rust Proof Promotes Wilson

Alexander (Al) Wilson, of Whiting,

DEPENDABLE PPI PRODUCTS

RUBBER AND PLASTIC DE-M LINERS
MONEL, STEEL, COPPER AND TITANIUM ANODE HOOKS
PLASTIC COATED PAILS AND DIPPERS
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ACID TANKS AND CONTAINERS
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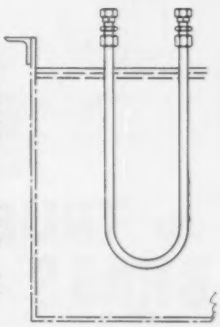
Maintenance - Free
TITANIUM HEATING COILS

Standard Titanium Heating Coils are made in U type units with 1" diameter tubing and .028" wall thickness. Special stainless steel fittings are furnished on each coil to connect the steam lines to the heating unit.

ADVANTAGES:
- Considerable lower cost than tantalum.
- More durable because of the use of heavier gage material, .028" over .013" of tantalum.
- Maintenance free because there is no harmful salt built up.
- Coils resist chemical attack in all nickel solutions and non-fluoride chromium solutions and temperatures of nitric acid.
- Many times lighter in weight than lead.
- Many times more durable than lead.
- Does not take up nearly as much space in tank as lead coils.
- Titanium coils can be used in nickel high chloride solutions; whereas, lead coils are objectionable.



Different shapes of coils can be furnished upon request.

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KOKOMO, INDIANA

Ind., has been appointed to the position of assistant regional manager for *Parker Rust Proof Co.'s* Western regional office located in Chicago.

Wilson joined the firm in 1953 as a technical representative and has been assisting customers in and about the Chicago area since that time.

Samuel Moore & Co. Appoints Distributors

Samuel Moore & Co., manufacturers of extruded plastic products for industry, announces the appointment of three exclusive national distributors for their Universal paint spray hose. They are, *The DeVilbiss Co.*, Toledo; *Binks Mfg. Co.*, Chicago; and *Gray Co., Inc.*, Minneapolis. All three are recognized leaders in the field of industrial paint spraying systems.

Vice-President Announced by Metasurf

Metasurf Corp. has announced the appointment of *Donald L. Miles* to vice-president and sales manager.

Mr. Miles has had fifteen years of metal treating experience and enjoys a wide acquaintanceship in the auto-

Donald L. Miles

motive and appliance fields. *J. M. O'Brien*, who formerly headed sales for the firm, will become executive vice-president.

Anchem Products, Inc. Promotes Damskey

Amchem Products, Inc., Ambler, Pa., has announced the promotion of *Leo C. Damskey* from sales supervisor to sales manager, Midwest District, for the Metalworking Chemicals Division. He will make his headquarters at the district sales office, in Detroit, Mich. In his new assignment, Damskey will be in charge of all operations in the Midwest District, for the firm.

At the same time, *Oran E. Crisler* was promoted from staff assistant to the newly created position of assistant sales manager, Midwest District, and *Ken C. Kramer* was also promoted to sales supervisor in the district formerly supervised by Damskey.

Damskey is a native of South Dakota and graduated from Michigan State with a B.S. in chemistry, in 1950. Prior to joining the company in 1956, he was employed by Sealed Power Corp., Muskegon, Mich.

Crisler, a veteran of 14 years employment with the firm, has specialized in sales and service to the automotive industry here and abroad. Previously, he was a research chemist with General Motors, Detroit, for 14 years. He's an alumnus of Wayne University.

Kramer's new duties will be supervising sales activities in the states vacated by his predecessor, Damsky. He came to the firm in January, 1955,

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CHEMICAL POLISH FOR ALUMINUM

Alchemize

from DuPont, where he was a sales representative of aluminum electric conductors.

New Foreign Subsidiary for Catalytic Combustion Corp.

Catalytic Combustion Corp., Detroit, Mich., announces the formation of a new European subsidiary, *KAVAG (Katalytische Verbrennungsgesellschaft, M.B.H.)*, with offices and factory located at Gondsroth-Hessen, West Germany. *Erwin C. Betz* has been named managing director.

Mr. Betz was born and educated in Germany, but has spent much of his professional life in the United States where he is a naturalized citizen. Prior to assuming his new duties, Mr. Betz was plant engineer for the parent company.

Coated Abrasives Appoints Dickey

The appointment of *Robert C. Dickey* as vice-president and general manager has been announced by *Coated Abrasives, Inc.* He entered the abrasives manufacturing industry as a research and service engineer, and became plant manager at Michigan

Robert C. Dickey

Abrasive Co. In assuming his new duties, Dickey remains on the staff as manufacturing processes consultant.

A graduate mechanical engineer of Pennsylvania State University, Dickey also attended Buffalo University and Princeton.

Pittsburgh Plate Appoints Freriks

Appointment of *Roger D. Freriks* as manager of *Pittsburgh Plate Glass Co's.* Ditzler Color Division in Detroit was announced recently. He succeeds *John F. Green*, who has been named general manager of the paint and brush division's Pacific Coast Operations with headquarters at Torrance, Calif. Mr. Freriks joined the company in December, 1959, and prior to that time had been associated with the Rinshed-Mason Co. of Detroit as factory manager.

A native of Columbus, Ohio, Mr. Freriks is a graduate of Ohio State University. He is a member of the Detroit Engineering Society, a past president of Detroit Society for Paint Technology and former chairman of the Manufacturing Committee for the Federation of Societies for Paint Technology.

Mr. Green has served as manager of the division since 1955. He joined the company as a clerk at Oakland, California in 1933 and has since been associated in numerous supervisory capacities with the paint division's operations at Los Angeles, Portland, Milwaukee, and Atlanta. He is a native of Portland and was graduated from Leland Stanford Junior University.

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The radial segment construction of the Zip-Tip Buff permits it to perform equally well on flat or contoured surfaces. The cross-cutting movement of the spoke-shaped segments prevent work streaking while it breaks up straight-line patterns on the surface.

- Zip-Tips are available in a wide variety of all cloth constructions —also combinations of cloth and sisal.
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- Zip-Tips are perfectly balanced —require no raking.

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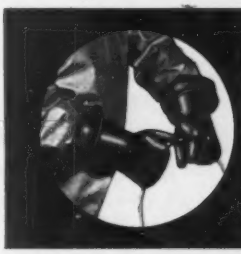

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- longer glove life is needed.

Surety Sureseal Gloves, (made from Hycar) give positive protection against the greatest number of acids and other corrosive liquids and wear up to 14 times longer than competitive materials. They are more snag, abrasion and puncture-proof and the exclusive Surety Turn-Cuff gives added protection for arms and prevents liquid from getting into the glove.

Tell us your requirements and test a pair today — at our expense. Write on your letterhead naming your glove jobber and you will receive a pair by return mail.

THE SURETY RUBBER CO.
CARROLLTON, OHIO

IN CANADA: Safety Supply Co., Toronto

DeVilbiss' St. Louis Branch Moves

The St. Louis factory branch of *The DeVilbiss Co.* has moved to a new building in the Page Industrial Center at 1501 Fairview. The new building houses the area sales office, engineering and service center, and provides warehouse space. The building is 100 x 148 feet, providing more than 13,000 square feet of space.

The St. Louis office is off Page Boulevard, a mile from Lindberg Boulevard (By-Pass 66) and only a short distance from U. S. 40, Mark Twain Expressway and the airport.

Edward F. (Ted) Luzius, district sales manager, heads the branch.

Dyna-Empire, Inc. Appoints Export Co.

Dyna-Empire, Inc., Garden City, N. Y., announces the appointment of *Electronic Manufacturers' Export Co.* (EMEC), 127 Grace St., Plainview, N. Y. as export sales representative of their entire commercial and industrial product lines.

NEWS FROM CALIFORNIA

NEWS FROM CALIFORNIA

What the owners claim to be the largest and most completely equipped plating laboratory on the West Coast is included among the facilities of a new precious metal plating shop recently opened at 11240 Playa Ave., Culver City, Calif. by Burton Silverplating Co.

The company is owned by *Jerry Burton*, president of the Metal Finishing Association of Southern California. His brother, *Joseph Burton*, is plant manager, and *Paul Ginder* is plant superintendent.

The new laboratory employs four full time chemists and three full time inspectors for quality control. It is equipped for microscope thickness testing, colorimetric testing, and strip testing gold plated thicknesses down to 0.000005". Such extremely thin deposits of gold, it was explained, are applied in some operations as a flash for tarnish protection until ready for soldering, as well as for protection during handling.

The new plant represents an investment of $250,000 for building and equipment. It has been equipped for specialization in industrial precious metal plating for the electronics, aircraft, missile, and printed circuitry fields. The facilities include ten gold tanks, ranging in size from 35 to 125 gallons, for a total of 400 gallons of gold solution, including acid gold, cyanide gold, and 24 karat cyanide bright gold. There are three rhodium tanks — 15, 30 and 50 gallon capacity, and a 2-gallon platinum tank. The present plant is the outgrowth of a hole-in-the-wall shop which Jerry Bur-

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120,000 SQUARE FEET

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IJH 59A

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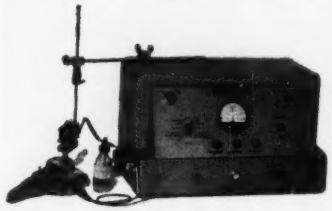
accurate . . . simple . . . quick with MODEL 955



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- virtually automatic
- 90-95% accurate
- simple operation

Model 955 determines the thickness of heavy or decorative chromium, silver, tin, cadmium, zinc, brass, copper, nickel, lead and other alloy deposits, on various basis metals (including Copper-Nickel-Chromium composite coatings). Write for Bulletin 400 . . . and ask for a demonstration or 15 Day Free Trial!

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Specify KOCOUR test sets from your supplier.

ton set up in 1946 with one 90-gallon cyanide tank, and himself and Brother Joe as the entire working crew.

William Griff, formerly a plating engineer for Motorola, Inc., Phoenix, Ariz., became allied with Graphic Circuits, Inc., Los Angeles, as a process engineer recently.

His move to Southern California made it necessary for Griff to resign as president of Phoenix Branch, A.E.S., a post he has held during the past 18 months. He was a charter member of the Phoenix Branch and one of the prime movers in efforts to get a Western Regional Conference of A.E.S. branches organized.

Floyd Hume of the Arizona Plating & Supply Co., Phoenix, first vice-president, has succeeded Griff as president.

Promotion of *Gordon R. Kastler* to manager of the Salt Lake City, Utah, branch of the *L. H. Butcher Company* was announced recently by the subsidiary of the *Udylite Corporation*. He has been assistant manager of the branch for the past six years.

Gordon R. Kastler

The new branch manager attended Eagle Grove Junior College in Eagle Grove, Iowa, and served in the Southwest Pacific with the U.S. Army Intelligence Corps during World War II.

A visitor to Southern California in mid-May was *E. Lamar Gostin*, president of Metal Processing Co., Inc., Cedar Grove, N. J. Gostin addressed Phoenix and Los Angeles Branches of the A.E.S. on Electroless Nickel Plating, and engaged in some business conferences in both areas with his west coast manager, *Gene Lozell*.

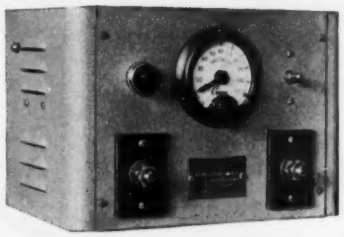
George Wharmby, formerly a salesman and cost engineer for Cadmium Nickel and Plating Co., Los Angeles, recently joined the sales staff of the Chem. Research Co. of Los Angeles, and has been assigned to a sales territory in the Phoenix, Ariz., area.

Ronald E. Cunningham has been named director of sales for Anadite, Inc., South Gate, Calif., a chemical milling and metal finishing firm doing work for the aircraft, missile, and electronic industries.

Cunningham is credited with developing a number of new color anodizing techniques for aircraft interiors and electronic components. For the past three years he has been the company's assistant sales director and coordinator of research and development.

E. F. Houghton & Co. has opened a new plant at 54 Tanforan Ave., South

SAVE PRECIOUS METALS and PRECIOUS TIME with MACARR AUTO-TIMING CONTROL



How It Works:

Connect in the cathode line, plug into 115V AC source, set timer, and put MACARR PMC "on" — Insertion of work on cathode rod of any amperage between 2 and 150 will automatically start timer, will time for preset interval. Simultaneously at this point a visible and audible alarm operates; also current to work is automatically reduced to a level where it is not plating or deplating. Removal of work resets PMC and it is ready for next load without the operation or manipulation of any switches.

PMC-150 Model—2-120 second time range with 2A to 150 current rating. Other models available with special time and current ranges.

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THE LAST WORD IN QUALITY

San Francisco, for production of industrial oils and chemicals. The new facility includes equipment for saponification, sulphonation, esterification, compounding, and condensation reactions. It is reported to have a production capacity 50% greater than the former plant at 1500 Davidson Ave., San Francisco.

The plant manager is *A. S. Horwirz. John Bermingham* serves as western sales manager. Offices and warehouses are maintained in Los Angeles, Portland, Seattle and Vancouver.

Kaiser Aluminum & Chemical Corp., Oakland, Calif., is reported to have developed a practical new method for giving aluminum sheets a variety of colored patterns in the form of a patented inlay sheet on which conventional anodizing procedures can bring out sunfast colors.

After anodizing, the sheet pattern is highlighted in color. It is being produced in gauges from 0.030 through 0.064″, flat or coiled to 36″ widths. Embossed patterns available include stucco, diamond, ribbed, and square, in color combinations of gold, natural aluminum, dark gray, or light gray.

The new inlay sheet product is said to be suitable for architectural trim, automotive and appliance trim, and for various office and residential purposes.

Recent executive changes and personnel transfers in industries allied with metal finishing in California include the following:

William A. Venzel has been named manager of the paint finishing system division for the C. F. Butz Engineering Co., Azusa, Calif.

George Matacek has been transferred from Chicago headquarters of the Bee Chemical Co. to serve as chief chemist at the company's newly established Western Division in Gardena, Calif.

Donald L. Hess, formerly in the Camden, N. J., office of Titan Metal Mfg. Co., has been transferred to the firm's Southern California sales engineering staff.

Russell C. Taylor has been promoted from Los Angeles branch manager of the American Filter Co., to Pacific regional manager, and has been succeeded as Los Angeles manager by *Charles J. Bressound.*

The Norton Co. of Worcester, Mass., abrasives manufacturers, has announced appointment of *William M. Harkness* to the newly created post of plant engineer in Santa Clara, Calif.

The Physical Metallurgy Committee, Institute of Metals Division, Metallurgical Society of A.I.M.E., held a conference on "The Response of Materials to High Velocity Deformation" in Estes Park, Colo., July 11 and 12. Papers presented dealt largely with the crystallographic, metallographic and basic phenomena that occur in metals under high strain rate.

Harvey Aluminum Co. has announced plans for the addition of a new bar mill and conduit facilities at its Torrance, Calif., plant. The aluminum reduction capacity of the Dalles, Oregon, factory will be increased 25%. Facilities for billet casting, wire rod, and related products at the Dalles mill

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Tumb-L-Matic Type XLC units are true general purpose barrels designed to handle the widest possible range of plastic and metal parts . . . either wet or dry process.
For more detailed information on Type XLC units or other Tumb-L-Matic equipment, supplies or processes, write:
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Tumb-L-Matic offers a complete line of abrasives, compounds and finishing media . . . from stock. Write for price list.
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Model 20 New Holland KREIDER Centrifugal Dryer

Air-Dry, Spin-Dry action assures moisture-free surfaces in *half the time!* Eliminates scoring and marring, cuts down on rejects. Drying costs nose-dive!

SPECIFICATIONS:

1-h.p. motor—220, 440, 550 volts—2 or 3 phase. Spins 75-lb. loads at 825 r.p.m. Quiet V-belt drive. Arc-welded steel plate construction. Weight 490 lbs. Requires minimum floor space. Meets N.E.C. specs. Auxiliary electric or steam heating units available as optional equipment.

Send for illustrated 4-page folder. Write Dept. M-760

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

will also be increased, it has been announced.

California Anodizing Co. Opens New Plant

California Anodizing Company has opened its new and streamlined plant at 464 Victory Ave. in South San Francisco. The firm, newly organized by a group of San Francisco industrialists, was established to meet the rapidly increasing demand for specially treated aluminum products. The modern plant is the largest facility in the Bay Area for treating aluminum products used in aircraft and missiles, electronics and construction industries, according to *Arthur Loube* of San Francisco, president of the new firm.

Cost of plant and equipment was in excess of $250,000. A battery of eleven 26-foot tanks makes possible special processing of aluminum including chemical conversion coatings, clear and color anodizing.

Associated with Loube in the firm are *Harry Liss*, vice-president; *Fred Lachman*, secretary and *Max Galant*, treasurer. *Russell Young* of San Carlos, who has had many years of experience in the industrial plating field, will serve as general manager of the operations. Thirty men are being employed in the operations.

(L to R) Louis Poletti, industrial realtor; Lee Troutman, Utah Construction Company's industrial department; Ferd Lachman, CAC secretary; Harry Liss, vice president; Russell Young, general manager; Max Galant, treasurer; Arthur Loube, president and Les Davis representing Harvis Construction Company, plant builders.

"Exposure Studies of Organic Pigments in Paint Systems" was the subject of a talk given by *Vincent C. Vesce*, technical director, Allied Chemicals, Inc., before the May 11 meeting of the Los Angeles Society of Coating Technology.

Mr. Vesce selected for discussion five vehicle systems comprising two alkyd, two lacquers and one emulsion. He also discussed a range of pigments from the seven different classes of organic pigments.

The speaker explained that in exposure tests made at Miami, Fla., over a period of nine months all the paints were prepared at the same PVC except the emulsion which contained an extra 20% extender pigment. Panels were all duplicated and sprayed over a baked primer on phosphated steel. Exposure was at 45° South. The speaker subdivided the results into four groups, the extremes of which, he said, were those that showed good color retention for nine months at all concentrations in all vehicles, and those that faded in all vehicles in all concentrations in three months.

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Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Additional Candidate for 3rd Vice-Presidency

Richard C. Barrett

A fourth candidate for the third vice presidency of the Supreme Society has been nominated. He is *Richard C. Barrett*, a member of the Bridgeport Branch and president of Barrett Chemical Products Co., Shelton, Conn.

Born in Portland, Ore., and educated in California, Mr. Barrett has many years of experience in industrial electronics equipment development, notably in the field of radio frequency heating. He organized his present firm to manufacture and market the Barrett sulfamate nickel plating process. He is also retained by various firms as a consultant on electronic and electro-chemical applications.

Mr. Barrett is a past officer of the branch, which he joined in 1948, has been elected twice to the Board of Managers, and has served as a delegate for the last four years. He presented a technical paper at the 1954 convention and is scheduled to present another one at this year's convention. He is presently co-chairman of the eighth Interim Meeting to be held in Hartford in 1961.

Columbus Branch

The Annual May Banquet was held on Thursday, May 5, at Presutti's Villa, with 45 members and guests present. Dinner was followed by a short business meeting at which 1960-61 branch officers were installed, and new applicant, *Kenneth J. Cave*, was elected to membership.

Guest speaker of the evening, *George Finneran* of Weeks-Finneran Ins. Agency, Columbus, Ohio, presented a hilarious talk on "How to Resist Salesmen."

L. D. McGraw,
Secretary

British Columbia Branch

A general meeting was held on Tuesday, May 3rd, at the Lougheed Hotel, North Burnaby. Following cocktails and dinner, the meeting opened at 8:40 p.m. with President *Nelson Shepherd* in the chair, who welcomed guests and members. *H. Georgelin* was admitted to membership. *John P. Nichols* gave an outline of the future plans of the Society with regard to territorial grouping of branches throughout the U.S.A. and Canada.

The meeting was then turned over to *W. Marquardt*, to act as moderator during the question and answer period. Members of the Branch asked questions and Mr. Nichols consented to try and provide the answers. Questions were asked on a variety of topics, the majority centering around finances and the general tenor of the answers were that we would have to stand on our own two feet. Mr. Marquardt turned the meeting back to Mr. Shepherd, who thanked Mr. Nichols on behalf of the Branch.

Douglas Armstrong,
Secretary

Chicago Branch

The Branch held its annual "Ladies-Nite" at the Austin Fine Arts Club, 808 N. Parkside Ave., on Saturday evening, May 7. The social hour began at 6:30 P.M., and a buffet dinner was served in a very congenial and attractive club dining room.

The program was a sound and color movie of a trip taken by *Mr. and Mrs. Carmie Crawford* called "Around the World in 79 Days." The photography, musical sound-track, editing, and narration, all done by Mr. Crawford, was interesting and highly entertaining.

Christopher Marzano,
Publicity Chairman

Midwest Regional

The librarians of the various branches comprising the Midwest Regional Council met Saturday, May 14, to plan the educational program of the Annual Regional Meeting this fall. This meeting was attended by *S. P. Gary*, chairman, *Robert Campbell, Harold Ellis, Curt Hunsacker, John Devendorf, Jack Petersen, Lou Ragne, Richard Aikin*, and *Murray Rounds*, who decided on the format of the fall meeting and a tentative slate of speakers.

The meeting will be held on October 29, 1960 at the University of Notre Dame, South Bend, Ind. Registration will be at 9:30 A.M. The technical session will begin at 10:00 A.M. Lunch will be at the Morris Inn. In the afternoon there will be three workshops covering mechanical finishing, electroplating, and organic finishing.

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Waterbury Branch

The Branch held its annual "Old Timers Night" on Thursday May 12, 1960 at the Roger Smith Hotel. Among the festivities was the installation of the officers for the coming year, conducted by *Henry Strow*. The new officers are: President, *William Giesker;* 1st Vice-President, *Louis Porretti;* 2nd Vice-President, *Albert Griffith;* Librarian, *Patrick Mazzamaro;* and Secretary-Treasurer, *James Kennedy*. Mr. Kennedy announced that the 21st New England Regional Meeting had been a complete sell out.

Earl Couch introduced the guest speaker, *Wes Cassell* of Lea Mfg. Co., who spoke on the "Historical Development of Chromium and Cadium Plating Processes." Mr. Cassell started in the plating business working for the pioneers of the two processes and had many stories and facts about the early development and marketing of these processes. The talk was well received by the many members and "Old Timers" present. After the meeting refreshments were served. This was the last regular meeting of the season.

F. A. Schneiders

Blue Ridge Branch

The regular meeting was held May 6, 1960 in the Coach Room of the 52 Diner in Winston-Salem, N. C. President *Dr. Nelson Murphy* presided over the business meeting. Twenty-five members and guests were present.

The election of officers for 1960-61 was held. Those elected were: *Bruce Wallace*, president; *Carl Witherspoon*, first vice-president; *Grover Galloway*, second vice-president; *Donald McGee*, secretary-treasurer; *Fred Ploszay*, librarian. An election was also held to select the board of managers. Those elected were: *Mike Milo*, *Dr. Nelson Murphy* and *T. R. Boggess*.

The membership decided to hold the next meeting in Blacksburg, Va. as a family picnic. This meeting will be held on the campus of Virginia Polytechnic Institute. Present plans call for a tour of the Physics Department for the men and a tour of the Home Economics Department for the women. The members hope that this picnic will be an annual affair.

After the business meeting *Bob Probert* introduced the speaker for the evening, *Al Korbelak*, of Sel-Rex Corp., Nutley, N. J., who spoke on gold plating. A brief history of precious metals plating was given. The main part of the talk covered the methods, uses and properties of gold plating.

Donald H. McGee,
Secretary

Buffalo Branch

The Branch held its final meeting of the 1959-60 season Friday, May 6, at the Niagara Manor, Buffalo, N. Y. with a total of 30 members and visitors in attendance. One new member, *Malcolm Howell*, and *Mrs. Joan Wiarda*, a transfer from the Chicago Branch, were welcomed by Branch members.

Harold Shapiro and *George Wolf* reported on the success of the Technical Societies Fair held in Buffalo Memorial Auditorium, at which the Branch sponsored a booth. A potential of 10 new members resulted from the exhibit. *Ray Kilroy* gave a favorable report on sickness. *Leon Nowak* and *Ralph Stemmerich*, who have been on the sick list, were in attendance. *Rolland Campbell* reported on the Regional Board Meeting held in Elmira, N. Y., April 30th, and was then elected as the carryover delegate to the 1961 meeting in Rochester, N. Y.

Dr. W. Andrew Wesley (extreme right), 1st vice-president of the National Society of the AES, installed the new officers of the Buffalo Branch. Shown left to right: Harold Shapiro, president; John Donaldson, 1st vice-president; Robert Lienert, 3rd vice-president; Robert Eich, secretary.

Chuck Fotheringham presented a dynamic talk on what the City of Buffalo can offer in bidding for the 1966 Convention. *Ward Stewart* of the Buffalo Convention Bureau stated that the Bureau is prepared to give the Branch their full co-operation in securing and planning a convention. The Branch voted in favor of holding an exposition in 1966 if so asked.

Mrs. Joan Wiarda was elected to re-

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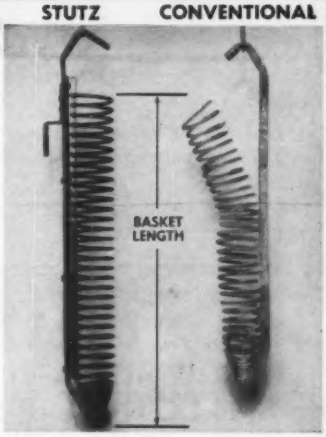

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place *John Donaldson* as an alternate delegate to the convention. The secretary was requested to submit Mrs. Wiarda's name to National Headquarters for approval.

President *Rolland Campbell* introduced the guest of the evening, *Dr. W. Andrew Wesley*, 1st vice-president of the Supreme Society, who reviewed the structure, objectives and accomplishments of the Society. Following his talk, Dr. Wesley installed the officers for 1960-61 season and then turned the meeting over to *Harold Shapiro*, newly installed president.

A rising vote of thanks was given to Rolland Campbell the retiring President.

President Harold Shapiro presented pins to the following Past Presidents:

Joe Ruff	1938-45
Doc Wernlund	1948-49
Bert Kirchhoff	1949-51
Tony Nigro	1951-53
Jim Moneypenny	1953-55
Doc Janis	1955-56
Ralph Mead	1956-57
Fred Goeckel	1957-58
Frank Rudolph	1958-59
Rolland Campbell	1959-60
*Charley Logan	1945-47
*Siebert Johnson	1947-48

*Deceased

Robert E. Lienert,
Secretary

St. Louis Branch

The regular monthly dinner meeting was held at the York Hotel Wednesday night May 11, with 25 present for dinner. The business meeting was called to order by President *William Piel* with 38 members and guests present. The large attendance was due to the members of the plating school being present to obtain their certificates.

There was a short business session, which consisted of *Lou Berra* reporting on the success of the spring banquet and *Andy Julius* reporting on his trip to the midwest regional meeting held in Milwaukee. *Ward Kelly* was called on to present the certificates to the graduates of the plating school. The following were present to receive their certificates: *Sanford E. Akins, Louis J. Berra, Elgert Crocker, Kermit H. Diebold, John W. Eggeman, Jr., George Forir, Stephen Kirchner, William H. Piel, Charles Sweeney, Mahesh Pratap Singh, Samuel F. Taylor, Louis Voelker, Robert Wann, William Wann, Richard Wade.* Not present but completing the course was *Vincent Toth.*

Andy Julius was called upon to install the new officers for the coming year. *George Koderhandt* was installed as president, *Homer Thomen* as 1st vice-president, 2nd vice-president — *Pete Young. Louis Berra* and *Ward Kelly* retained their positions of treasurer and secretary, respectively.

William Piel presented *William George*, president 1958-59, with a past president pen and his gavel. *George Koderhandt* took over the meeting and presented Piel his gavel and past president pen. The meeting was turned over to Librarian *Richard Gotsch*, who introduced *Kermit Diebold* chief engineer of Peerless Lacquer and Chemical Co., St. Louis, Mo. Mr. Diebold talked on "Transparent Coating For Metals." He had many samples to show the different coatings. The meeting was adjourned after an active question and answer period.

Ward Kelly,
Secretary

Indianapolis Branch

Forty-four members and guests attended the May 3rd meeting at the Construction League. Before the meeting at 8:00 P.M., eight additional persons came. President *Les Reynolds* opened the meeting with usual introductions followed by reports from secretary and treasurer. A short report was given by *Robert Stewart*, junior member of the Tri-State, on the Cincinnati meeting, saying this meeting, the sixth one for the Tri-State, was the best one yet.

Nine new members, voted in the society by acclamation are: *Russell L. Bowers, Thomas D. Hathaway, James Anoskey, Donald E. Kinkaid, Curtis H. Reynolds, Kenneth L. Turpin, Robert L. Thomas, Gill Reagan* and *Milford Plummer.*

The annual election of officers followed and *Quentin Shockley*, a board of managers member, thanked the present officers and explained how people were picked for the ticket. He said geographic conditions were considered and also those who have worked on various committees. Several nominations were made from the floor. The election was as follows:

President — *John Holland.*
1st Vice-President — *Steve O'Connor.*
2nd Vice-President — *Mark Trook.*
Librarian — *Robert Stewart.*
Secretary — *Edna Rohrabaugh.*
Treasurer — *Paul Johnson* (1 year).
Board of Managers — *Robert Bruck, John Hood,* and *Quentin Shockley.*

The program for evening was given by *King Rhuly* of the Michigan Chrome and Chem. Co., who talked on "Stop-off Materials and Rack Coat-

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ings." Mr. Rhuly was a very good speaker and told of many funny incidents and anecdotes of the stop-off materials. Many questions followed the talk and many good ideas were gained in the meeting. Adjournment was at 9:35 P.M.

Edna Rohrabaugh,
Secretary

San Francisco Branch

The May meeting was called to order at 8:30 p.m. Friday, May 6, by President *Trevor Harry*. Two guests were present, *Al Powell* of E. X. Browning Co., and *Russell Young* of Calif. Anodizing Co.

Mr. Harry introduced the guest speaker, *John P. Nichols*, A.E.S. Supreme Society Secretary, who officiated during the installation of the 1960-61 officers. Pictures of the inauguration were taken by *Julio Battaion*.

Following is the complete list of the officers: president, *F. M. Condrott;* secretary - treasurer, *Calvin E. Snelgrove;* 1st vice-president, *Stanley Bammann;* 2nd vice-president, *Elston A. Flores;* librarian, *Richard L. Mitchem;* sergeants-at-arms, *Murray Hart, Duane J. Heinlen, Julius C. Tervay;* board of managers, *J. R. Pattenger, Harold Smallman, Dominic Maviglia, Fred W. Huntington, Trevor G. Harry.*

From left to right: F. M. Condrott, Julius C. Tervay, Stanley Bammann, C. E. Snelgrove, Duane J. Heinlen, Elston A. Flores & Richard L. Mitchem.

A discussion of the possibility of forming a West Coast regional group was placed before the membership by Mr. Nichols. It was agreed to place this suggestion under consideration.

The business meeting was opened and the following brought before the membership: 1. Discussion of picnic plans. Stanley Bammann will investigate facilities at Laurel Park. 2. It was decided to discuss the educational session at the June meeting. 3. A motion was made to procure a hospitality room at the Statler for the annual convention in July. The following committee was selected for this detail: *Harold Smallman* and *C. E. Snelgrove.*

C. E. Snelgrove,
Secretary - Treasurer

Dayton Branch

The annual business meeting was held as a dinner meeting at the Yum Yum Inn on May 18. The officers elected for the coming year are: President, *Byron A. Bowman;* 1st Vice-President, *Lawrence J. Hadlock;* 2nd Vice-President, *Robert D. Fisher;* Secretary, *Duane Prosser;* Treasurer, *A. W. Wendt;* Librarian, *Walter Anderson.*

The retiring Secretary, *Richard Clinehens,* reported that on May 1, 1959 the Branch had 123 members but on May 1, 1960 this was only 104, a decline of 19. He explained that 9

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CALENDAR

July 22-24: 5th Anniversary Convention, N.A.M.F., Statler-Hilton Hotel, Los Angeles, Calif.

July 24-28: 47th Annual Convention, A.E.S., Statler-Hilton Hotel, Los Angeles, Calif.

Sept. 16: 2nd Metropolitan Regional Technical Session, Newark Branch A.E.S. Host, Robert Treat Hotel, Newark, N. J.

Sept. 17: 24th Annual Educational Meeting and Banquet, A.E.S., Hotel Statler, Boston, Mass.

Oct. 9-13: Fall Meeting, The Electrochemical Society, Shamrock Hotel, Houston, Texas.

Oct. 12-14: 7th National Symposium, American Vacuum Society, Cleveland-Sheraton Hotel, Cleveland, Ohio.

Oct. 17-21: 42nd National Metal Exposition and Congress, A.S.M., Trade and Convention Center, Philadelphia, Pa.

Oct. 27-29: 73rd Annual Meeting, National Paint, Varnish and Lacquer Association, Drake Hotel, Chicago, Ill.

Oct. 29: 2nd Annual Midwest Regional Conference, University of Notre Dame, So. Bend, Ind.

Oct. 31-Nov. 2: 38th Annual Meeting, Federation of Societies for Paint Technology, Hotel Sherman, Chicago, Ill.

Nov. 8-11: First National Exposition and Congress, Society of Die Cast Engineers, Detroit Artillery Armory, Detroit, Mich.

Jan. 17-18: Annual Meeting and Conference, Society of Vacuum Coaters, Lake Towers Motel, Chicago, Ill.

Feb. 3-4: 3rd Annual Dixie Regional Technical Session, A.E.S., Blue Ridge Host Branch, Hotel Roanoke, Roanoke, Va.

new members had been elected, 2 had transferred into the Branch, 4 had transferred out, 4 had resigned, and 20 had been suspended. The average attendance at meetings during the 58-59 season was 36 and during the 59-60 season it was 38. Dick also pointed out that 38% of the annual dues of each member which is retained by the Branch was spent in sending out meeting notices. If this had been done by an outside service it would have been double this amount. The Branch gave Dick a rising vote of thanks for his long and generous service to the Branch.

The speaker of the evening was *Joseph L. Jackson*, technical service director, R. O. Hull & Co., Inc., Rocky River, Ohio. Mr. Jackson discussed the various factors affecting the efficiency of zinc and cadmium solutions and related them to practical plating problems. He showed that, particularly with zinc, higher efficiency could be obtained by increasing the metal content, the caustic content, and the temperature and by lowering the cyanide content. Lowering the metal, caustic, or temperature and increasing the cyanide will result in lower efficiency.

The meeting concluded with refreshments courtesy of the Branch.

L. A. Critchfield,
Publicity Committee

Southeastern Branch

Thirty-two, including three ladies, from Greater Atlanta, Adel, and Rome, Ga.; Anniston and Birmingham, Ala.; Conover, N. C.; and Detroit, Mich.; met at the Architects and Engineers Institute in Atlanta on Friday, May 13. After a buffet style dinner with fish and chicken, President *Bob M. Taylor* opened the meeting by reporting on the success of a previous meeting at General Time in Athens, Ga. For the August ladies night, *Clem Hohner* was named chairman, to be assisted by *Jerry LaChappell* and *Harry Pink*.

Librarian-elect, *George W. Taylor*, cited the success of the company — sponsored meetings in Carrollton and Athens, and announced that his new program as librarian will lean towards more such company-sponsored meetings; half in Atlanta and half out of Atlanta. He asked for further suggestions, and stated that he already has several volunteers and expects a lively enthusiastic coming year.

Mr. Taylor recognized that *Dave J. Griffin* was one of the longest service members attending and called upon him to install the new officers. Dave was his usual outstanding oratorical self as he very ceremoniously converted elects into officers. Taylor handed down his gavel to *Myron M. Randman* who became the new branch president. *Vince Cashen* was installed as first vice-president and membership chairman. *R. Bruce Taylor* became second vice-president. *R. H. Stogner, Sr.* was reinstalled as secretary and treasurer. *George W. Taylor* became the librarian. *Robert H. Probert*, recently transferred back into Southeastern, was appointed assistant secretary, a newly created informal office requiring no responsibility nor any involvement in processing meeting notices nor any financial management.

The librarian, *Harold Willingham*, introduced the speaker for the evening, *Dr. Peter B. Sherry*, assistant professor of chemistry, Georgia Institute of Technology, who delivered the final of a series of two talks on crystallography or "Recent Developments in the Nature of Metal Surfaces." Dr. Sherry went into the latest practical and theoretical findings in the nature of growth in crystals along flat, indented, sliped, and other types of metal surfaces; illustrating clearly on a large blackboard and with actual models of crystal lattice structures. A more attentive and interested local meeting has never been witnessed.

Robert H. Probert,
Assistant Secretary

Los Angeles Branch

Plans for the formation of a Western Regional Group of the A.E.S. moved a step forward at the May 11 meeting of the Branch when President *Frank Virgil* appointed a special committee to confer on the proposal with representatives of other western branches. He named the three members of the board of managers — *Norman McEwan, Norman Painter* and *Clare Ver West*. The committee was expected to hold a meeting some time in June to map an outline of ideas for the proposed grouping of branches. Those plans will be submitted at a meeting of western branch representatives to be held during the national convention in July.

Present at the May 11 meeting was *William Griff*, president of Phoenix branch, where the idea for a regional conference originated about a year

ago. Griff told Los Angeles members that Arizona and Southern California are bound by many mutual ties of industry and technology which would make an exchange of ideas at a regional conference beneficial to platers from both areas.

Griff declared that, while he recently resigned as president of Phoenix Branch in consequence of his moving to Los Angeles, his successor in the chair, *Floyd Hume*, was a supporter of the regional conference idea and would collaborate with other West Coast branches in bringing it to fruition.

Mrs. Glenn (Dolly) Beckwith, chairman of the national convention ladies' committee, appeared at the May 11 meeting and proposed that the general convention committee chairmen meet with the ladies group in May and June to help determine final plans for the ladies entertainment program.

President Virgil announced that the growing membership of the branch and its expanded schedule of activities has made it necessary to enlarge the official staff. In accordance with an amendment to the by-laws adopted recently, Virgil appointed two assistants to Educational Committee Chairman *Don Baudrand*. *William Pardee* and *Dan Ross* are serving in that capacity, and will assist Baudrand in arranging for technical speakers and members to serve on discussion panels at future meetings.

Secretary *Robert H. Pooler* was also given an assistant, in the person of *Bert G. Adams*, who will relieve the secretary of some of the correspondence and record-keeping, and take over the publicity end.

Frank Hayward, *Helen Tess*, *Mary Eakin*, *Franz Leo* and *William A. Hamilton* were initiated into membership.

Mr. Baudrand has initiated a poll by mail to determine the type of technical program the members prefer. He recently mailed to all members a ballot on which 43 subjects of discussion were listed. The members were given three choices in expressing opinion on types of speakers and subjects. They could mark a subject as "Very Interested," "Moderately Interested" or "Not Interested."

Future meeting programs will be based on the results of the poll. Baudrand disclosed that the educational committee will endeavor to arrange speakers and choice of subjects in accordance to preferences expressed on the ballot. The subjects placed up for vote included plant visitations, foreign speakers on plating, water and waste control, ultrasonics, and 36 phases of plating shop processing, including anodizing, all types of plating, buffing, polishing, and plant arrangement. Results of the poll will be announced at the June meeting.

The speaker at the May 11 meeting was *E. L. Gostin*, president of Metal Processing Co., Inc., Cedar Grove, N. J. He presented a paper on "Electroless Nickel Plating," and illustrated parts of the talk with illuminated slides and graphs.

PORCELAIN ENAMEL INSTITUTE

The Institute has announced the staff addition of *Robert S. Thompsen*, who has been appointed to the newly-created position of manager of technical activities. He will coordinate all technical programs of the association and provide advice on technical aspects of non-technical PEI activities.

Thompsen was formerly with Babcock and Wilcox Co. and Firth Sterling, Inc. He is a graduate in ceramic engineering from Virginia Polytechnic Institute, and also studied at The Ohio State University and Carnegie Institute of Technology.

Thompsen is a member of the American Ceramic Society and the American Society of Metals and is a registered professional engineer in Virginia and Georgia.

SOCIETY OF DIE CASTING ENGINEERS

The First National Die Casting Exposition and Congress will be held in the Detroit Artillery Armory from November 8-11, 1960. The exposition will be the first show in America devoted exclusively to the rapidly expanding die casting field.

In conjunction with the exposition, a technical congress of broad coverage designed to present the latest new developments and trends in the die casting field will be sponsored by the Society.

Subjects planned for discussion in the form of technical papers and panel sessions will include die design; vacuum die casting; anodizable die castings; die steels; buffing, polishing and plating of die castings; zinc, mag-

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nesium and brass die casting techniques; lubricants; quality control; handling and treating of metal; machining of dies and die castings; standards; cost control; new markets; large die castings; die casting design; die casting alloys; and die casting equipment and automation.

Persons attending the exposition will include job shop and captive die casters, as well as buyers of die castings, production executives, design engineers and stylists from consuming companies both in United States and foreign countries.

AMERICAN SOCIETY FOR METALS

The ASM Technical Council has been established as a major step in preparing the Society for its role in a vastly expanding metal industry. The trustees, in creating the new council, said its purpose is to further ASM's technical objectives through supervision and coordination of the Society's technical committees.

The Council is to be concerned with technical programs as presented in the Metal Congresses, the many technical publications of the Society, technical development, and activities of the 111 ASM Chapters throughout the United States and Canada.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS

Corrosion engineers will hold five meetings in the United States and one in Canada this fall to hear technical papers and to discuss corrosion problems. In addition to the conferences, short courses will be held in Ohio, Oklahoma and California.

Locations and dates of regional conferences are: Western, San Francisco, Cal., Oct. 6-7; Southeast, Atlanta, Ga., Oct. 6-8; Northeast, Huntington, W. Va., Oct. 11-14; North Central, Milwaukee, Wis., Oct. 19-20; South Central, Tulsa, Okla., Oct. 25-27; Canadian, (Eastern Meeting) Montreal, Que., Nov. 14-16.

The short courses will be jointly presented by N.A.C.E. and universities in Ohio, California and Oklahoma. Short course schedule is: Ohio State, Columbus, Ohio, Sept. 12-16; U. of Cal., Berkeley — U. of Cal., Los Angeles, held in San Francisco, Oct. 3-5; U. of Okla., Oct. 3-5, Norman, Okla.

More information on the conferences and courses may be obtained by writing National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2, Tex.

AMERICAN VACUUM SOCIETY

The Seventh National Symposium of the Society will be held October 12, 13, and 14th at the Cleveland-Sheraton Hotel in Cleveland, Ohio. Contact: American Vacuum Society, Box 1282, Boston 9, Mass. Authors interested in submitting papers contact *C. R. Meissner*, Georgia Institute of Technology, Engineering Experiment Station, Atlanta, Ga.

N. A. M. F.

As of June 1st, the National Association of Metal Finishers and the NAMF - owned *Plating Management* magazine has occupied new and larger headquarters at 11 Park Street, Montclair, N. J. The phone number remains the same.

The new, completely air conditioned quarters will house the following offices and/or activities: executive director, public relations, membership, committee relations, and other administrative functions. Magazine departments to make the move include editorial, advertising, and production. The circulation department will remain in Cedar Grove, N. J. for at least two more months before being relocated.

NEW BOOKS

Metallizing of Plastics

By Harold Narcus. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 1960. Price: $5.50. 208 pages including index.

The author, who has been actively engaged in this field for nearly twenty years, has organized the material for inclusion in this book from the standpoint of production requirements of the reader, rather than from theoretical and chemical considerations. Thus, anyone interested in commercial applications of metalized plastics will find complete details for carrying out the various processes, whether it be chemical reduction, vacuum evaporation, gas plating, or metal spraying.

By eliminating theoretical aspects, which would be of interest only to a very small number of researchers, and by resisting the temptation to list the numerous published formulas, all of which duplicate the results desired, Dr. Narcus has kept the size of this man-

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ual down, this being reflected in the low price. At the same time, the reader does not have to wade through a mass of inconsequential data to find the actual production procedures in which he is really interested.

Metal Industry Handbook & Directory

Published by Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S. E. 1, England. 1960. 570 pages. Price: 21s.

The 49th edition of this annual handbook-directory is issued free of charge to subscribers of the weekly journal *Metal Industry*, who comprise those engaged in the non-ferrous metal industries. As usual, the book is divided into four sections: general properties of metals and alloys, general data and tables, metal finishing, and the directory. For the field it serves, the volume is one of the best sources of quick information, and the section on finishing is adequate, although not extensive. The very complete directory for buyers is always one of the best features of this handbook, but is of interest to British rather than to foreign readers.

The Merck Index

Edited by Paul G. Stecher. Published by Merck & Co., Inc., Rahway, N. J. 1960. 1641 pages. Price: $12.00.

The completely new seventh edition of this index of chemicals and drugs contains nearly 10,000 descriptions of individual substances, more than 3,300 structural formulas, and about 30,000 names alphabetically arranged and cross-indexed. This last feature enables the user to locate a particular chemical description by page number, even if he knows only the generic name, brand name, or systematic chemical name of the material.

A special section lists more than 400 organic reactions, with original and review references, together with a description and structural representation of each reaction. Hazards, toxicities, and other safety factors are mentioned, as well as commercial availability, grades, and characteristics. And, as usual, numerous tables will be found at the end of the index.

The Corrosion and Oxidation of Metals

By Ulick R. Evans. Published by St. Martin's Press Inc., 175 Fifth Ave., New York, N. Y. 1960. 1,094 pages, including index. Price: $25.00.

This encyclopedic work is not a revision of Prof. Evans' previously published book "Metallic Corrosion, Passivity and Protection," but is just as detailed and important. For those doing basic research on corrosion, the author's discussion of hundreds of literature references will be invaluable, while, for the engineer, the practical applications as well as the theoretical and scientific aspects of corrosion technology should be of great interest.

Inhibitors, passivity, materials of construction, protective coating, boiler operation, and testing are given full coverage, as well as thermodynamic and kinetic considerations, stress corrosion, fatigue corrosion, and conjoint action. There appears to be no phase of the subject slighted, which makes this the one complete reference volume for the engineer's library.

PATENTS

(*Continued from Page* 111)

Copper Anode

U. S. Patent 2,923,671. *Feb.* 2, 1960. *G. C. Van Tilburg, assignor to American Metal Climax, Inc.*

An anode consisting of oxygen-free high conductivity copper to which is added from 0.0001% to 0.001% by weight of lithium to effect dissolution of improved uniformity of said anode with minimal sludge formation while forming a cathode deposit free of nodular growths.

Abrasive Blasting

U. S. Patent 2,924,912. *Feb.* 16, 1960. *H. F. Schulte, assignor to Wheelabrator Corp.*

A blasting apparatus including an open ended blast compartment having blast media throwing means disposed to project blast media into the interior thereof, a stationary vestibule arranged in open communication with one end of said compartment and extending therefrom for a distance substantially equal to the length of the longest workpiece to be accommodated, and a second movable vestibule of similar length longitudinally movable relative to said blast compartment and said stationary vestibule and so dimensioned as to telescopically move therewithin.

Dipping Rack

U. S. Patent 2,925,063. *Feb.* 16, 1960. *J. Mondry, assignor to Michigan Chrome and Chemical Co.*

Apparatus for suspending articles in a tank, comprising a pair of inner and outer frames arranged in a nested relation and having pairs of downwardly extended legs.

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Barrel Plating Machine

U. S. Patent 2,923,675. *Feb.* 2, 1960. *J. Round*

Apparatus comprising a barrel self-contained unit formed of a frame, a shaft mounted on the frame, a barrel suspended from the shaft, means for rotating the barrel from the shaft comprising belt pulleys on the shaft and the barrel, drive belts engaging the pulleys for rotating the barrel and suspending the barrel from the shaft, and chain sprocket wheels on the shaft, and an independent chain drive for driving said sprocket wheels and the shaft comprising an endless chain mounted on each side of the vat, ledges on the vat on which the upper runs of the chains are supported so that the sprocket wheels on the shaft of said barrel self contained unit are supported by the chains whereby the chains can carry said unit along the vat and whereby when the unit is held against longitudinal movement the chains rotate the barrel, and stops preventing the barrel self contained unit from traveling longitudinally of the vat, so that the chains rotate said shaft and the barrel, and means for releasing the stops so that the chains are free to carry the barrel unitary structure longitudinally along the vat.

Tumbling Barrel

U. S. Patent 2,924,914. *Feb.* 16, 1960. *E. H. Garwood*

A deburring and polishing barrel formed as a dodecahedron and with two opposite sides thereof parallel, a drive shaft extending into one of said parallel sides, means securing said shaft to said side, means detachably securing the other of said parallel sides to the adjacent sides of the barrel to provide a removable door, and an extension of said shaft projecting into the barrel.

Polishing Belt

U. S. Patent 2,924,916. *Feb.* 16, 1960. *H. E. Welker, assignor to General Motors Corp.*

An endless buffing belt comprising an endless belt backing member, a series of binder strips and a plurality of sets of buffing fingers formed from medially folded multiple ply fabric material and bound together with the folded faces confronting each other by each binder strip to provide a plurality of rows of bound fingers, with each of the rows of bound fingers being attached to the belt backing member in a continuous line extending circumferentially of the belt and parallel to a circumferential edge thereof with the fingers in an upstanding position relative to the flat face of the belt to furnish a plurality of buffing fingers.

Continuous Electroplating Apparatus

U. S. Patent 2,924,563. *Feb.* 9, 1960. *W. R. Gray, assignor to Pittsburgh Plate Glass Co.*

Apparatus for the continuous electroplating of a glass sheet having a mechanically sensitive metallic mirror surface.

Vacuum Coating

U. S. Patent 2,925,062. *Feb.* 16, 1960. *J. Schwindt, assignor to W. C. Heraeus, G.m.b.H.*

An apparatus for vacuum coating strip material.

Porcelain Enamels for Light Metals

U. S. Patent 2,925,351. *Feb.* 16, 1960. *D. M. Judd, assignor to Ferro Corp.*

A lead-free, alumina-free porcelain enamel having a firing temperature range of between 900°F. and 1,050°F. which consists essentially of the following constituents calculated as weight percentages:

	Per Cent
R_2O	21-35
R_2O_3	2- 5
R_2O_5	11-21
RO_2	44-50

where R_2O represents the oxides Na, K and Li; R_2O_3 represents the oxide of B; R_2O_5 represents the oxides of P and Sb; and RO_2 represents the oxides of Si and Ti, the summation of the weight percentages of R_2O, R_2O_3, R_2O_5, and RO_2 ingredients equalling 100%.

Brushing Machine

U. S. Patent 2,925,689. *Feb.* 23, 1960. *R. O. Peterson, assignor to The Osborn Mfg. Co.*

A machine for surface treating articles comprising a plurality of power driven rotary brushes mounted for rotation about parallel axes arranged generally in a substantially closed circle to define a central operating region adapted to receive such articles for tumbling and brushing action thereon, and means for driving a closely opposed pair of said brushes in the upper part of said machine in opposite directions at high speed to impel abrasive downwardly into such operating region.

Hot Dip Aluminum

U. S. Patent 2,926,103. *Feb.* 23, 1960. *R. M. Brick, assignor to Continental Can Co., Inc.*

The method of coating base metal with aluminum which comprises preheating the base metal to a temperature of about 1,000 to 1,200 degrees F., applying molten aluminum in excess thickness to a surface of the base metal, wiping the coated metal by a device having a contacting surface of refractory material essentially insoluble in and wettable by the aluminum at the operating temperature, said material being selected from the group consisting of aluminum carbide and the silicides and borides of chromium, tungsten, and titanium, and immediately chilling the coated metal and thereby solidifying the aluminum.

Tin-Nickel Bath

U. S. Patent 2,926,124. *Feb.* 23, 1960. *R. Taylor and R. M. Phillips, assignors to Chrysler Corp.*

A process which comprises electro depositing tin-nickel alloys from an aqueous bath consisting essentially of stannous-nickel chloride and hydrochloric acid in amount such that the acidity of said bath corresponds to a pH of no greater than about 1.0.

Corrosion Preventive

U. S. Patent 2,926,108. *Feb.* 23, 1960. *D. L. Andersen, assignor to General Mills, Inc.*

A process for corrosion inhibition of metallic substances which comprises covering said metallic substance with a mono-molecular film of a compound selected from the group consists of

$$R'NHCR_2CR_2COOX,$$
$$(R'NHCR_2CR_2COO)_2Y$$
$$R'N(CR_2CR_2COO)_2X_2$$
$$R'N(CR_2CR_2COO)_2Y$$

where R is selected from the group consisting of hydrogen and lower alkyl radicals containing less than four carbon atoms, R′ is a hydrocarbon radical containing 8 to 22 carbon atoms, X is selected from the group consisting of hydrogen and an alkali metal, and Y is an alkaline earth metal.

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2—Udylite—500 A.—9 V.
3—Udylite—500 A.—12 V.
1—H-VW-M—1000 A.—6 V.
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1—Udylite steel—42 x 15.
2—H-VW-M—2 compartment, rubber 15x36.

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10—Industrial, Alsop, Sethco — all sizes — nickel and cyanide solutions.

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10-Baird barrels 2C tilting type.
8—Henderson barrels 5A tilting type.
4—Globe barrels.
2—Roto-Finish—DW-60-36-2 Rubber.
1—Roto Finish DW-22-36-1.

POLISHING MACHINES
3—Production Machine #101 — 7½ H.P. — 10 H.P.
4—#101 Tandum 15 H.P.
5—Acme A2.
3—Acme B10.
2—Divine Model VM-10 — 10 H.P.
2—L'Hommedieu 5 H.P. variable speed.
15-Holland 5 H.P. — 7½ H.P. — 10 H.P.
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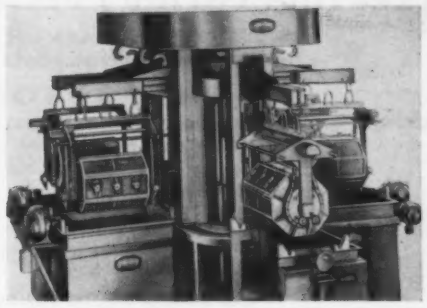

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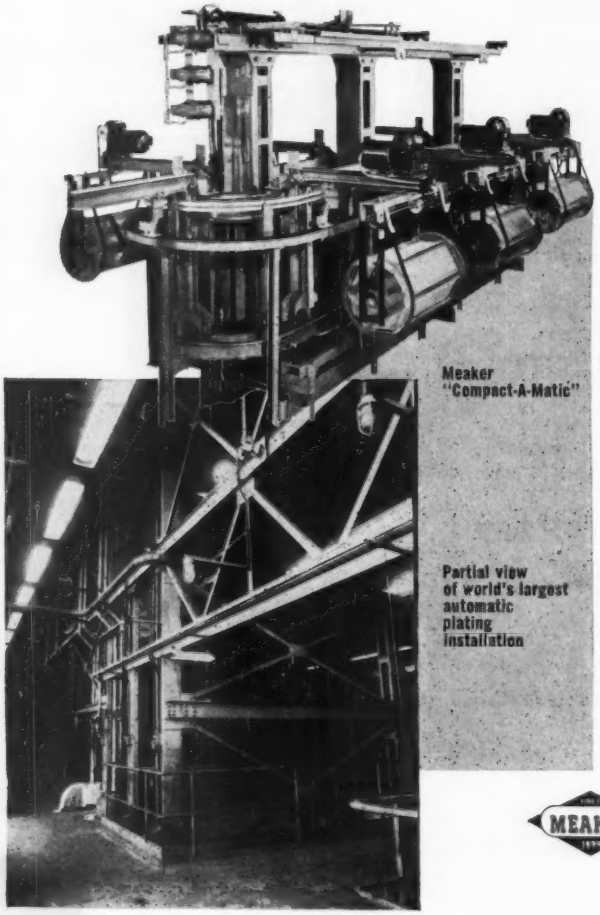

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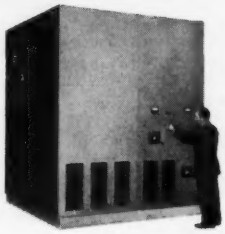

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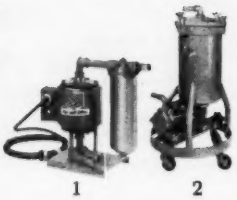

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